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The effect of dietary standardisation on exercise performance and physiological responses in male athletes

Alaaddine El-Chab (2016)

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PhD, Oxford Brookes University

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The effect of dietary standardisation on exercise performance and physiological responses in male athletes

Alaaddine El-Chab

Qzhqtf "Dtqqngu"Wpkxgtuk{ "

C"y guku'ku'uwdo kwgf "kp"r ctvkn'hwtkno gpv'qh'y g'tgs wktgo gpw'qh'y g"cy ctf "qh"
F qevqt "qh'Rj kquqr j { "

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'Lcpwct { "4238

Contributions / Authors work

Vj ku'y guku'ku'tguwn/ qh'y g'cwj qt "Cmcff kpg" Gn/Ej cd+ø'y qtmkp "vgtō u'qh'f guki p. "f cvc" eqmgev kpp. "f cvc" cpen{ ugu. "kpvgr tgvckpp" qh'y g'hp f kpi u. "cpf "y tkkpi "qh'y g'o cpwuekr ō"

Acknowledgement

"

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Ky qwf "htuv" cpf "hqtgo quv" rkg "v" yj cpni'o {" uwr gtxkuqtu" J grgp" Nki j vqy rgt." Ej ctrkg" Uko r uqp." cpf "Cppg" F grgz vcv" hqt" yj gk" uwr r qtv" cpf "gpeqwtci go gpv" f wtkpi "o {" Rj F O'K yj qtqwi j n{ "gplq{ gf "rgctpkpi "htqo {" qw0'

Ky qwf "rkg" v" yj cpni' Ej ctrkg" hqt" dgkpi "c" hpcvukle" o gpvqt." gur gekm{ "hqt" yj g" j qwtu" qh" kpvgtgukpi "f gdcvgu" cpf "f kuewukqu0Kj qr g" yj cv" yj gug" y km'eqpvkpwg" yj tqwi j qw'o {" ectggt0'

Vj cpni' {" qw" J grgp" hqt" {" qwt" eqpvkpwqwu" uwr r qtv" cpf "i wkf cpeg" kp" yj g" pwtkkqp" cur gev' qh' o {" Rj F O'Cuq" yj cpni' {" qw" hqt" uwr r qtvkpi "o {" kf gcu" cpf "cevkkkgu" cv" yj g" HHE0'

Ky qwf "v" yj cpni' Cppg" F grgz vcv" cpf "O ktko "Engi i "hqt" {" qwt" xcwcdng" eqpvtkdwkqp" v" o {" uwf lgu0'

C" ur gekni' yj cpni' v" o {" hco kn{." gur gekm{ " o {" o qo " cpf " f cf." hqt" yj gk" nqyg." gpeqwtci go gpv." cpf "hpcpekeni' uwr r qtv0"

Hkpcn{." Ky qwf "rkg" v" yj cpni' cm'o {" r ctvlekr cpw" hqt" yj gk" vko g" cpf "ghqtv" kp" eqo r ngvki " yj qug" nqpi " cpf "gzj cwukxg" gz gtekug" r tqvqeqnu0'

"

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Publications and conference abstracts

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Gn/Ej cd."C."Uko r uqp"E."Nki j vqy rgt "J 0'42380'Vj g"tgr tqf vekdkrk{"qh"cf lgv" wulpi "vj tgg" f khhgtgpv" f lgvct {"ucpfctf lcvkqp" vgej pls wgu" kp" cvj ngvgu0' *European Journal of Clinical Nutrition*"*kp"r tguu+0'

"

Gn/Ej cd."C0"Uko r uqp."E0"F grgz vcv"C0"Nki j vqy rgt."J 0'42370'F qgu"cf 37' "f khhgtgpeg"kp" ectdqj {f tcvg" kpvcng" chhgev" e{enlpi "r gthqto cpeg" cpf "r j {ukqmi kcn' tgu r qpug" kp" vckpgf " cvj ngvguA]Cduwcev_0'Dqqm'qh'Cduwcev"qh" vj g"42vj "Cpwwcn'Eapi tguu"qh"vj g"Gwtqr gcp" Eqmgi g"qh'Ur qtv'Uekgpeg0'

"

Gn/Ej cd."C0"Uko r uqp."E0"Nki j vqy rgt."J 0'42360'Vj g"xctkcdkrk{"qh"gpgti {"cpf "pwtkgpv" kpvcngu" wulpi "vj tgg" f khhgtgpv" f lgvct {"ucpfctf lcvkqp" vgej pls wgu" kp" cvj ngvgu]Cduwcev_0'Dqqm'qh'Cduwcev"qh"vj g"3; vj "Cpwwcn'Eapi tguu"qh"vj g"Gwtqr gcp'Eqmgi g"qh'Ur qtv'Uekgpeg0'

Abstract

"

Ur qtv' uelgpkuvu" j cxg" dggp" wulpi " f khtgtpv' vej pls wgu" vq" eqpvtqn' f lgvct { " lpcng" kp" cp" cwgo r v' vq" o kpk kug" vj g" ko r cev' qh' ugxgtcn' f lgvct { " eqo r qpwpv" qp" vj g" qweqo gu' qh' vj g" uwf { 0' Vj ku" ku" cej kxgf " d { " gko kpcvpi " uqo g" eqo r qpwpv" eqo r rvgv { " Itqo " vj g" f lgv" * uvej " cu" echgkpg" cpf " creqj qn" hqt " hgy " f c { u" qt " eqpvtqn' lpi " vj g" lpcng" d { " tgr nlecvi " y j cv' y cu" eqpuwo gf " dghqtg" vj g" hktuv' vlcu" r tkqt " vq" gxgt { " uwdugs wgpv' vlcu' Tgugctej gtu" j gr " r ctvkr cpw' tgr nlecvg' vj gk' f lgv' d { " wulpi " f lgvct { " ucpf ctf kucvqp" vqqu' uvej " cu' f lgvct { " tgecm' cpf " hqqf " tgeqtf " qt" d { " r tqxkf lpi " r tg/ r cenci gf " o gcu" * ucpf ctf kugf " f lgv' 0' Vj g" clo u' qh' vj ku" Rj F " y gtg" 3+ " vq" cuuguu" vj g" tgr tqf weklkv { " qh" c" f lgv' wulpi " f khtgtpv' ucpf ctf kucvqp" vej pls wgu. " 4+ " gzc kpg" y j cv' ghgevg' f qgu" 46/ j qwtu" ectdqj { f tcvg" o cplr wcvqp" y kj kp" c" 37' " xctkcvqp" j cxg" qp" gpf wtcepg" ecr cekv { " cpf " r j { ulqmi kcn' tgr qpugu. " 5+ " cuuguu" vj g" pgy " r tqr qugf " o gyj qf " vq" ucpf ctf kugf " f lgvct { " lpcng. " cpf " 6+ " o gcuwg" vj g" ghhece { " qh' gpeqwtci lpi " kpf kxkf wcu" vq" uvc { " y gm/ j { f tcvgf " qp" pgzv' f c { " j { f tcvqp" ucvwu' 0' Vj ku" Rj F " eqpenw gf " vj cv' ucpf ctf kugf " f lgv' ku" vj g" dguv' cr r tqcej " vq" eqpvtqn' f lgvct { " lpcng' 0' F lgvct { " tgecm' cpf " hqqf " tgeqtf " vej pls wgu" uq qwf " qpn { " dg" wugf " y j gp" rti g" ghgevg' ku" gzr gevfgf " cpf " vj g" f lgv' j cu" my " ko r cev' qp" vj g" kpvtxgpvqp' 0' Vj g" rls wkf " dcugf " ucpf ctf kugf " f lgv' vj cv' y g" r tqr qugf " y cu" hqwpf " vq" dg" cp" ghgevg" vej pls wg" y kj " uko kct " tgr tqf weklkv { " vq" uqrf " dcugf " ucpf ctf kugf " f lgv' * 4/5 " " cpf " 7' " xctkcvqp. " tgr gevvgv { " kp" gpgti { " cpf " o cetqpwtkpv' lpcngu' 0' Hwt vj gto qtg. " k' y cu' uwi i guvf " vj cv' c" 37' " f khtgpeg" kp" 46/ j qwt " ectdqj { f tcvg' lpcng' f kf " pqv' uki plhecpv { " chgevg' gpf wtcepg" ecr cekv { " pwtkpv' qz kf cvqp" cpf " drqf " i mequg lrevg' r xgn' kp" vclpgf " e { erkuu' 0' Hpcm { " k' y cu' eqphko gf " vj cv' gpeqwtci lpi " r ctvkr cpw' vq" f tkpm' y cvgt " kp" vj g" r tg/ vlcu' r tgr ctvqp" r gkqf " ku" pqv' gpqwi j " vq" cej kxg" gwj { f tcvqp" dghqtg" gztgekug" vguu' 0' Vj ku" Rj F " cf f u" gugpvcu' kphqto cvqp" vq" vj g" ctgc" qh' f lgvct { " ucpf ctf kucvqp" cpf " j gr u' ko r tqxg' vj g" s wcrkv { " qh' hwwt g' tgugetej " r tqlgewu' "

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Contents

[illegible]

VII

List of Abbreviations

DO "	"	"	dqf { "o cuu"
DO K	"	"	dqf { "o cuu"lpf gz ""
ET"	"	"	tgr gcwdkklv{ "eqghlekgpv"
EQ ₄ "	"	"	ectdqp"f kzkf g"
EX"	"	"	eqghlekgpv"qh'xctkckqp"
F _{tgecm'}	"	"	f kgvt { "tgecm'
GKDO T"	"	"	gpgti { "lpvcng"f kxkf gf "d { "dcuen'o gwdqrle"tcvg"
H _{geqtf} "	"	"	Hqqf "tgeqtf "
I K	"	"	i n{ecgo le"lpf gz "
J ki j gtEctd'"	"	"	c"f kgv'eqpvcklpi "76"i 0ni "DO ^{/3} "qh'ectdqj { ftcvg"
KUP GO "	"	"	kpvtpcvkpcn'lqwtpcn'qh'ur qt v'pwtckkqp"cpf "gz gtekug"o gwdqrkuo "
KQ"	"	"	kpvtpcvkpcn'qti cplucvkqp"ht "ucpf ctf kucvkqp"
LKUP ""	"	"	kpvtpcvkpcn'uqelgv{ "qh'ur qt u'pwtckkqp"
NK kgv"	"	"	rks wkf "r tg/r cenci gf "f kgv"
Nqy gtEctd"	"	"	c"f kgv'eqpvcklpi "69"i 0ni "DO ^{/3} "qh'ectdqj { ftcvg"
Q ₄ "	"	"	qz { i gp"
RCN"	"	"	r j { ukcni'cevxxkv{ "hgxgn"
Rev"	"	"	Rgtegpvkrg"
UF "	"	"	ucpf ctf "f gxkckqp"
U _{fkgv'}	"	"	Ucpcf ctf kugf "f kgv' "
UQf kgv"	"	"	uqrf "r tg/r cenci gf "f kgv"
WQuo ""	"	"	wtkpg"quo qmckv{ "
XQ ₄ "	"	"	qz { i gp"wr vcng"
XQ ₄₀ cz"	"	"	o czko wo "qz { i gp"wr vcng"
Xqkf 3""	"	"	htuv'o qtplpi "wtkpg"xqkf "

Xqkf4"	"	ugeqpf"wtkpg"xqkf"
Y " "	"	y cwt " "
Y r gcm"	"	j k j guv'y cwci g"qdvclpgf"t wtkpi "j g"XQ4o cz"guv"
"		
"		"

List of Figures

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Hki wtg"5040Eqo r ctkuqp"qh'yj g"co qwpv'qh'gpgti { "necn'tgr qtvf "qp'yj g'htuv'cpf "ugeqpf " xkuk/hqt "F_{tgecm} "

Hki wtg"5050Eqo r ctkuqp"qh'yj g"co qwpv'qh'gpgti { "necn'tgr qtvf "qp'yj g'htuv'cpf "ugeqpf " xkuk/hqt "H_{geqtf} "

Hki wtg"5060Eqo r ctkuqp"qh'yj g"co qwpv'qh'gpgti { "necn'tgr qtvf "qp'yj g'htuv'cpf "ugeqpf " xkuk/hqt "U_{f_lgv} "

Hki wtg"5070Eqo r ctkuqp"qh'yj g"co qwpv'qh'ectdqj { ftcv'xi +tgr qtvf "qp'yj g'htuv'cpf " ugeqpf "xkuk/hqt "F_{tgecm} "

Hki wtg"5080Eqo r ctkuqp"qh'yj g"co qwpv'qh'ectdqj { ftcv'xi +tgr qtvf "qp'yj g'htuv'cpf " ugeqpf "xkuk/hqt "H_{geqtf} "

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Hki wtg"50 0Eqo r ctkuqp"qh'yj g"co qwpv'qh'r tqvlp "xi +tgr qtvf "qp'yj g'htuv'cpf "ugeqpf "xkuk" hqt "F_{tgecm} "

Hki wtg"50 0Eqo r ctkuqp"qh'yj g"co qwpv'qh'r tqvlp "xi +tgr qtvf "qp'yj g'htuv'cpf "ugeqpf "xkuk" hqt "H_{geqtf} "

Hki wtg"5020Eqo r ctkuqp"qh'yj g"co qwpv'qh'r tqvlp "xi +tgr qtvf "qp'yj g'htuv'cpf "ugeqpf " xkuk/hqt "U_{f_lgv} "

Hki wtg"5030Eqo r ctkuqp"qh'yj g"co qwpv'qh'hcv "xi +tgr qtvf "qp'yj g'htuv'cpf "ugeqpf "xkuk/hqt " F_{tgecm} "

Hki wtg"5040Eqo r ctkuqp"qh'yj g"co qwpv'qh'hcv "xi +tgr qtvf "qp'yj g'htuv'cpf "ugeqpf "xkuk/hqt " H_{geqtf} "

Hki wtg'5050Eqo rctkuqp"qh'vj g'co qwpv'qh'hcv'i +tgr qtvgf "qp'vj g'htuv'cpf "ugeqpf "xkuk'hqt"
Ufkgv"

Hki wtg'600Eqo rctkuqp"qh'vj g'co qwpv'qh'gpgti { "equwo gf "qp'fc { "3'cpf "fc { "4'hqt"vj g"
UQfkgv'gej plswg"

Hki wtg'6040Eqo rctkuqp"qh'vj g'co qwpv'qh'gpgti { "equwo gf "qp'fc { "3'cpf "fc { "4'hqt"vj g"
NKfkgv'gej plswg"

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vj g"UQfkgv'gej plswg"

Hki wtg'6060Eqo rctkuqp"qh'vj g'co qwpv'qh'ectdqj { ftcvg'equwo gf "qp'fc { "3'cpf "fc { "4'hqt"
vj g"NKfkgv'gej plswg"

Hki wtg'700Qxgtxkgy "qh'vj g"gzr gtlo gpwn'cpf "hco kktkucvqp'tknu'r tqveqn'

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Hki wtg'7060Rctgf "fcv'qh'vj g'vko g'vq"eqo r ngvqp'hqt'gcej "cv ngv'dgwy ggp"Nqy gtEctd"cpf "
J ki j gtEctd"eqpf kkpqu"

Hki wtg'7070'O gf kcp"cpf "kpf kxf wcn'f khtgpegu"kp"vko g'vq"eqo r ngvqp"dgy ggp"vj g"y q"
ectdqj { ftcvg'eqpf kkpqu"

Hki wtg'800'Htgs wgpe{ "fkutkdwkqp"qh'j { ftcvqp"ucwugu"dcugf "qp"htuv'o qtplpi "wtkg"
uco r ngu"

Hki wtg'8040Vj g'f khtgpeg'kp'htuv'cpf "ugeqpf "o qtplpi "wtkg"quo qrcrkv'xcnngu"

Hki wtg'900Qxgtxkgy "qh'vj g'vj tgg'f khtg'gpv'r tqveqn'c."d."cpf "e"

Hki wtg'9040Vko g'eqwtug"qh'dmqf "i nxeug"eqpegpvcvqp'f wtkpi "vj g'i nxeug'vguv'wpf gt'tguv."
y cmkpi ."cpf "e{enkpi "eqpf kkpqu0'

Hki wtg'9050Vko g'eqwtug"qh'r nuoc'lpuwn'eqpegpvcvqp'f wtkpi "vj g'i nxeug'vguv'wpf gt"
tguv."y cmkpi ."cpf "e{enkpi "eqpf kkpqu0

Hk wtg"9060Rcktgf "f cvc"qh'vj g"lpetgo gpvcn'dmqf "i nwequg"ctgc"wpf gt"vj g"ewtxg"dgy ggp"cm'
eqpf klqpu0*c+"Tguv"vs."e{enpi 0*d+"E {enpi "vs."y cmkpi 0*e+"Y cmkpi "vs."tguv"

List of Tables

Vcdrg"300Co qwpv'qh'creqj qn'equwo gf "kp" f khtgpv'uwf kgu"qp"gpf wtcepg'r gthqto cpeg"

Vcdrg" 3040' O czko wo " tgeqo o gpfgf " creqj qn' kpcng" r gt " f c { " hqt " f khtgpv' v{r gu" qh' dgxgtci gu"

Vcdrg"400F guetkr vkp"qh'r gthqto cpeg'r tqveqnu"

Vcdrg"4040F guetkr vkp"qh'f kgvt { "ucpf ctf kucvkp"cr r tqcej gu"

Vcdrg"4050F kgvt { "ucpf ctf kucvkp"cr r tqcej gu'wugf "kp"lqwtpcnu'dgy ggp"422: /4236"

Vcdrg"4060Dtgcnf qy p"qh'H_{geqtf} "wug"d { "v{r g"cpf "f wtckp"

Vcdrg"4070C "dtgcnf qy p"qh'-pki'qt "o kpk cni'cr r tqcej ø'wug"d { "v{r g"

Vcdrg"500F kgv'hgf "vq'r ctvckr cpwu"qp"vj g'f c { "r tgegf kpi "xkuku"7"cpf "8"

Vcdrg"5040O gcp"cuuki pgf "cpf "equwo gf "gpgti { "cpf "o cetqpwtkgpv'kpcngu'hqt"F_{tgecm}"
H_{geqtf}."cpf "U_{fkgv}"

Vcdrg"5050O gf kcp" f khtgpeg"dgy ggp"cuuki pgf "cpf "equwo gf "pwtkgpv'kpcng'hqt"F_{tgecm}"
H_{geqtf}."cpf "U_{fkgv}"

Vcdrg"5060Mgpf cni'cw"B"eqttgrcvkp"dgy ggp"cuuki pgf "cpf "equwo gf "pwtkgpv'kpcng'hqt"
F_{tgecm} H_{geqtf}."cpf "U_{fkgv}"

Vcdrg"5070T grkcdkvw { "qh"gpgti { "cpf "o cetqpwtkgpv'kpcngu'hqt"F_{tgecm} H_{geqtf}."cpf "U_{fkgv}"

Vcdrg"600O gcp"gpgti { "cpf "o cetqpwtkgpv'kpcngu"qh'vckpgf "cy ngvu"qp"f c { "3"cpf "f c { "4"
qh"UQf kgv'cpf "NK kgv'equwo r vkp"

Vcdrg"6040Nko ku'qh'ci tggg gpv'hqt"vj g'o gcp" f khtgpegu'kp"r tqvklp"cpf "hcv'kpcngu"qh'
vckpgf "cy ngvu"dgy ggp" f c { "3"cpf "f c { "4"qh"UQf kgv'cpf "NK kgv'equwo r vkp"

Vcdrg"700F kgv'eqo r qukkp"qh'vj g'gzr gtlo gpvni'eqpf kkpqu"*P "? "32+"

Vcdrg'7040Uco r rg"J ki j gtEctd'fkgv'ht'c': 6'mi 'uwdlgev'tckp'pi '8'f c { u'r gt'y ggm'

Vcdrg'7050O gcp"*ÖUF +r rnuo c'nevcvg"cpf "i nwequg"eqpegpvcvkpu"cpf "tcvg"qh'r gtegxgf "
gzgtvkp'f wtkpi "gzgtekug'y j gp'r tgegfgf "d { "gkj gt"Nqy gtEctd"qt"J ki j gtEctd'fkgv""

Vcdrg'7060O gcp"*ÖUF +t gur kcvqt { "gzej cpi g'tcvkq"cpf "j gctv'tcvg"f wtkpi "gzgtekug'y j gp"
r tgegfgf "d { "gkj gt"Nqy gtEctd"qt"J ki j gtEctd'fkgv""

Vcdrg'8080Vj g'r j { ulecn'ej ctcevgtku'eu'qh'yj g'r ctv'ekr cpw"

Vcdrg'8040Vj g'ew/qh'h'xcnwgu'ht'yj g'f k'htgtpv'j { f tcvkqp'ucwwugu"

Vcdrg'8050'O gcp"htuv"cpf "ugeqpf "o qtpkpi "wtkpg"quo q'rnk { "qh'cyj ngvu."pqp/cyj ngvu."cpf "
qv'cn'r ctv'ekr cpw"

Vcdrg'9080Ej ctcevgtku'eu'qh'yj g'r ctv'ekr cpw'cv'dcugnd'pg"

Vcdrg'9040Rnuo c'i nwequg"cpf "kp'w'rk"ctgcu'w'pf gt'yj g'ewtxg'f wtkpi '82'o k'p"cpf "342'o k'p"
qh'yj g'4/j qwt'i nwequg'vgu'hqmqy kpi "gkj gt'tguv'y cmkpi "qt'twppkpi "

" "

Chapter 1

Introduction to dietary standardisation and assessment methods

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1.1 Introduction

Vj gtg"ctg"o cp{ "gzvcpqgwu"xctkcdngu"npqy p"vq"chgeu"vj g"lpvgtxgpkqp"*uki pcn"cpf "vj g" tgrkcdkxk{ "qh"vj g"vgu"pqlug"vj cv"cngtu"vj g"f gvevqp"qh"vj g"uki pcn"lgceqeng"("Dwtng." 4232-0Gzco r ngu"qh"gzvcpqgwu"xctkcdngu"lp"ur qtv"cpf "pwtkkqp"uwf lgu"lpenwfg"mdqtcvt{ " vgo r gtcwtg"cpf "j wo kfkf."co qwpv"qh"xgtcdn"geqwtci go gpv"fwtkpi "r gthqto cpeg"vguu." r j {ulecn"cevxkxk{ "cpf "fkgvt{ "lpvcng"vj g"fc{u"dghqtg"cpf "fwtkpi "vj g"gzr gtko gpv0Hckkpi "vq" eqpvtn"qt"grko lpcvg"vj gug"lcevtu"o c{ "ngcf "vq"hcng"eqttgrvqp"cpf "lpeqttgev"tguwmu0 Vj gtghqtg."tgugtej gtu"uj qwf"vcng"gzvc"o gcuwtgu"vq"kuqnv"vj g"qweqo gu"qh"vj g"uwf { " htqo "vj g"gzvcpqgwu"xctkcdngu0

Fkgvt{ "ucpfctf kucvqp"j gr u"o kpo kug"vj g"ghgeu"qh"o cp{ "fkgvt{ "eqo r qpgru"npqy p"vq" j cxg"cp" ghgeu"qp"vj g"lpvgtxgpkqp0Uqo g"qh"vj gug"eqo r qpgru."uwej "cu"echhkgp"cpf " creqj qn"j cxg"cp"cewg"ghgeu0Vj gtghqtg."qpn{ "c"hy "fc{u"qh"ucpfctf kucvqp"ku"tgs wktgf " *Fgudtqy "gvcr04234="Ngeqwtg"("Uej wj "422; +0Qvj gt"eqo r qpgru."uwej "cu"ur r ngo gpw." ecp"j cxg"ce"ej tqple"ghgeu"vj kej "tgs wktg"cnpi gt"r gkqf "qh"eqpvtn"*Ks wktgf q"gvcr04224-0 Fkgvt{ "ucpfctf kucvqp"lp"tgugtej "uwf lgu"lpxqrkgu"glkj gt"vj g"grko lpcvqp"qt"vj g" tgrdecvqp"qh"vj gug"fkgvt{ "eqo r qpgru0Hqt"lpucpeg."uqo g"eqo r qpgru"uwej "cu"echhkgp" ecp"dg"grko lpcvgf"htqo "vj g"fgv"ht"ce"hy "fc{u."y j kg"ky kn'dg"xgt{ "fkhlewn"vq"grko lpcvgf " ectdqj {ftcv"eqo r ngvnl "htqo "vj g"fgv0Kp"vj ku"ukwcvqp."ectdqj {ftcv"lpvcng"o c{ "dg" ucpfctf kugf"d{ "cunkpi "uwlgeu"vq"tgrdecvg"vj gkt"fgv"r tkqt"vq"gej "vkr0Vj ku"tgf wegu"vj g" pqlug"cf f gf "vq"vj g"uki pcn"j gpeg"vj g"tgrkcdkxk{ "qh"vj g"vgu0

Fkgvt{ "ucpfctf kucvqp"ku"ewtgpwn{ "cp"wpf gt/uwf kgf "hgrf "lp"ur qtv"cpf "j wo cp"pwtkkqp0 Vq"qwt"npqy ngf i g."qpn{ "hy "tgxky u"j cxg"fluewuugf "vj ku"qr le"*lgceqeng"("Dwtng"4232=" J qr nkpu"gv"cr03; ; ; +0Kp"vj gkt"tgxky "qh"tgugtej "uwf lgu"lpxgurki cvkpi "r gthqto cpeg" gpj cpego gpw"lp"grkg"cvj ngvu."J qr nkpu"cpf "eqngci wgu"dtghn{ "o gpvqp"gf "vj g"pggf "vq" ucpfctf kug"fkgvt{ "lpvcng"qpg"vq"vy q"fc{u"dghqtg"vkcnu0Hwtvj gto qtg."vj g{ "ftgy "tgcf gtai" cwgpvqp"vq"cn"ng{ "r qkp"vj cv"fkgvt{ "ucpfctf kucvqp"ecp"ukm"ngcf "vq"ht"eqpukf gtcdrng" xctkcdngu0lgceqeng"cpf "Dwtng"*4232+"y gtg"vj g"htuv"vq"r wdkuj "cp"ctveng"fluewuulpi "vj g" qr le"qh"fgvt{ "ucpfctf kucvqp0Eqpugs wgpwn{ "vj gkt"ctveng"y kn'dg"tghgtgf "vq"qp"ugxgtcn" qeecuqp"vj tqwi j qw"vj ku"vj guku0Vj g"ctveng"htuv"rduvgf "vj g"fgvt{ "eqo r qpgru"tgs wtkpi " ucpfctf kucvqp"cpf "vj g"r quukdrng"eqpugs wpegu"qp"gzgtekug"r gthqto cpeg"cpf "o gvcdrkuo " y j gp"vj g{ "ctg"pqv"eqpvtnmgf0Uqo g"gzco r ngu"lpenwfg"gpgti {."ectdqj {ftcv."hmkf." echhkgp."cpf "creqj qn0Pgzv"vj g"cwj qtu"gzco kpgf "vj g"fgvt{ "ucpfctf kucvqp"r tqvceqn

wugf "kp"vj g"kwgtpevkqpcn"lqwtpcn"qh"Ur qtv"P wtkkqp"cpf "Gz gtekug"O gxcdqrkuo "KUP GO +"
 r wdrlecvkqpu"htqo "4226"vq"422; "vj cv"ko r ngo gpvgf "cp"cewug"kwgtxgpvkqp"y kj "cp"ko r cev"qp"
 gz gtekug"r gthqto cpeg"kp"j wo cpu0'Vj g"ctveng"hwpf "vj cv"e"82' "qh"uwf lgu"kpwtwewf"
 r ctvlekr cpw"vq"hmjy "vj gk"j cdkwcn"fkv"cpf "vj g"o clp"vej pls wg"wugf "vq"j gr "uwdlgev"vq"
 tgr rlecvg"vj g"fkv"y cu"d{"wulpi "c"hwqf "tgeqtf "H_{geqtf}+0J qy gxgt."qpg"hmj "qh"vj g"uwf lgu"
 y j gtg"uwdlgeu"y gtg"cuugf "vq"tgr rlecvg"vj gk"pqto cnf"fkv"hwkf "vq"ej gem"vj g"cf j gtgpeg"qh"
 uwdlgeu"vq"vj g"kpwtwewkqpu0'K'y cu"cuug"tgxgcrgf "vj cv"qpg"kp"ulz "uwf lgu"fkf "pqv"wg"cp{"
 f kvct {"ucpf ctf kucvkqp"vej pls wg0Hkpcn{."lgceqeng"cpf "Dwtng"wugf "hw"qh"vj gk"r tgxkqwu"
 uwf lgu"cu"gzco r ngu"vq"o gcuwg"vj g"xctkcdk{ "kp"gpgti {"cpf "o cetqpwtkgpv"dgw ggp"wy q"
 gzt gto gpvcn' vlcnu0' Hqt" gzco r ng."kp" c" uwf {"qh" gkug" uy ko o gtu."vj g" y kj kp/uwdlgev"
 f khtgpeg"kp"ectdqj {f tcvg"y cu"dgw ggp"203"cpf "505"i 0ni /30Vj g"uwdlgev"y kj "c"505"i 0ni /3"
 f khtgpeg"tclugu"uqo g"eqpegtpu"cdqw"ku"ko r cev"qp"vj g"qweqo g"qh"vj g"uwf {0'K'o gcpu"
 vj cv"vj g"uwdlgev"y j q"y gki j u"92"mi "+equwo gf "0452"i "ectdqj {f tcvg"vj g"fc {"dghqtg"vj g"
 ugeqpf "vkcni"eqo r ctgf "vq"vj g"htu0'Vj ku"rti g"f khtgpeg"kp"ectdqj {f tcvg"kpvcng"ecp"cngt"
 r gthqto cpeg"cpf "r j {ukmqi kcnitgur qpugu"Twcj "gv"cn04227+0'

Vj ku"ej cr vgt"y km'hwewu"qp"vj g"tqng"qh"fkvct {"eqo r qpwpv"cu"gz vcpqgw"xctkcdrgu"cpf "vj g"
 f khtgwpv" cr r tqcej gu"vq" f kvct {"ucpf ctf kucvkqp0' C" vj qtqwi j "gzco kpcvkqp"qh" f khtgwpv"
 f kvct {"eqo r qpwpv"y km'eqxgt"vj gk"ghgev"qp"r j {ukcn'r gthqto cpeg."r j {ukmqi kcn'cpf "
 dkqmi kcn'r ctco gvgtu0'O vej "qh"vj g"fkewuukqp"y km'dg"fqo kpcvgf "d {"vj kpi u"vq"fq"y kj "
 gpf wtcepg"ecr cek{"cpf "nguug"cwgpvkqp"vq" ugeqpf ct {"r ctco gvgtu" *g0 0'XQ4o cz" cpf "
 mcevcg-0'K'cf f kkp."vj ku"ej cr vgt"y km'r tqxf g" c"dtlgh"tgxky "cdqw"vj g" f khtgwpv"fkvct {"
 cuuguu gpv"vej pls wgu"hmjy gf "d {"cp"gzco kpcvkqp"qh"vj g"o gj qf u"wugf "vq"ucpf ctf kug"
 f kvct {"kpvcng"kp"tgugtej "uwf lgu0'Vj gk" cf xcpvcu gu"cpf "fkucf xcpvcu gu"y km'cuug"dg"
 f kweuugf 0'

" 1.2 Dietary components that require standardisation

1.2.1 Energy

Tgugtej gtu"o c {"cuuwo g"vj cv"uwdlgeu"r ctvlekr cvkpi "kp"tgugtej "uwf lgu"ctg"kp" c"ucvg"qh"
 gpgti {"dcrpeg"cpf "cf gs wvg"gpgti {"cxckcdk{0J qy gxgt."vj ku"o c {"pqv"cry c {"u"dg"vj g"
 ecug0'Nqpi "rtg/vlcni"r tgr ctvlekr"r gkqf u"K0'ugxgtcn"fc {"u"qh"fkvct {"eqpvtqn"o ki j v'r wv"
 tgugtej "r ctvlekr cpw"cv'tkum'qh'wpgt/gc vkpi "I qtku" ("Y guvgvtr "3; ; ; =O kpg"gv"cn03; ; 3=

Uqemg{" 3; : 7+0 I qt ku" cpf " Y guvgtvtr " *3; ; ; + " gzco kpgf " y j gy gt " wpf gt/tgr qt vpi " qh" j cdkwcn'hqf "kpcng"kp"tgugtej "r ct vkr cpw"ku" f wg"vq"wpf gt/tgeqtf kpi "qt"wpf gt/gcvpi 0 Wpf gt/tgeqtf kpi " ku" f ghkpgf " cu" vj g" f kuetgr cpe { " dgvy ggp" gpgti { " kpcng" cpf " gpgti { " gZR gpf kwtg"y kj "pq"ej cpi gu"kp"dqf { "o cuu"y j gtgcu."wpf gt/gcvpi "ku"ceeqo r cplgf "y kj " y gki j v'quu"*O kpg"gv'cr0'3; ; 3+0I qt ku"cpf "Y guvgtvtr " *3; ; ; + "o gcuwgf "wpf gt/tgeqtf kpi " cpf "wpf gt/gcvpi "d { "eqo r ct kpi "tgr qt vgf "hqf "kpcng"wulpi "c"9/f c { "y gki j gf "H_{geqtf} "y kj " o gcuwgf "gpgti { "gZR gpf kwtg" *kpenw kpi "tguvpi "o gcvdqre"tcvg"cpf "r j { ulecn'cevxxk { + "cpf " y cvgt "quu" wulpi "f gwgkwo / rcdgrgf "y cvgt 0 T gugtej gtu"tgetwkgf "46"j ki j n { "o qvxcvgf "ngcp" hgo crg" f kgvkcpcu"y j q"y gtg" hco kkt "y kj "ceewtcvg { "nggr kpi "c"9/f c { "y gki j gf "H_{geqtf} 0 Vj g" uwf { "tgr qt vgf "c" f kuetgr cpe { "qh"/38' " dgvy ggp" gpgti { "kpcng" cpf "gZR gpf kwtg"y kj "c" uki p hkecpv'f getgcug"kp"dqf { "o cuu"*/2079"mi "vs."2029"mi "qxgt" c"eqpvtqn'y ggm 0 Vj gtghqtg." vj g'cwj qtu"eqpenw gf "y cv'v j g" f kuetgr cpe { "y cu'cwtkdwgf "vq"wpf gt/gcvpi 0"

O kpg" gv'cr0' *3; ; 3+ "r gthqto gf "c" uko kkt "uwf { "cnuq" wulpi "c"9/f c { "y gki j gf "H_{geqtf} "cpf " tgr qt vgf "32' "wpf gt/gcvpi "kp"62"j gcnj { "cf wv"o gp0 Hkpcn { "Uqemg { " *3; : 7+ "gzco kpgf " wpf gt/gcvpi "d { "wulpi "f wr rdecv"r qt vqp"o gyj qf " *y g"o quv'ceewtcvg"o gyj qf "hqt"cuugulpi " f kgxt { "kpcng"= O ci nqu" (" [cppenwkwk "4225+ "qxgt"38" f c { u0 Vj ku"o gyj qf "eqpukw"qh" eqmgevpi "f wr rdecv"u"qh"cm'hqf "cpf "f tkpm'eqpuwo gf "d { "r ct vkr cpw 0 Vj g"uco r ngu"y gtg" vj gp"cpn { ugf "ej go kcm { "vq"o gcuwgf "gpgti { "cpf "pwtkgpv'eqpv'v *O ci nqu" (" [cppenwkwk " 4225+ 0 Vj g'tguwv"qh"v j g'uwf { "tgxgcngf "y cv'gpgti { "kpcng"y cu'tgf wegf "d { "42' " f wg"vq"v j g" j ki j "dwtf gp"qp"r ct vkr cpw 0 Wpf gt/gcvpi "pqto cm { "qeewtu" f wg"vq"v j g"kpctgcugf "dwtf gp"qp" r ct vkr cpw" y j kej "cngtu" vj gkt " dgj cxkwt0 Hqt " gzco r ng." uwdlgeu" o ki j v' t { "vq" cxqkf " eqo r ngz "hqf "kp" qtf gt "vq"o cng"v j g"tgr rdecvqp"qh"v j g" f kgv"gcukgt" *J km { "F cxlgu"4224=" Uej w { "gv'cr0'3; ; 4+0 Uqo g"r ct vkr cpw"o ki j v'gxgp" hkp "k'cp"qr r qt wpk { "hqt" f kvpi " *J km { "F cxlgu"4223+0"

C"pgi cvxg"gpgti { "dcrpeg"eqw { "cnuq"dg"tgcej gf "y j gp" uwdlgeu"kpctgcug"v j gkt "vckpki " xqmw g" *k0 gpgti { "gZR gpf kwtg"kp"v j g"r gkqf "dghqtg"v j g"gzr gto gpvn'vkn"cpf "v j gp" hkn" vq"eqo r gpucv" hqt "v j g" f hgtgpeg" d { "kpctgcupki "v j gkt "gpgti { "kpcng" *Mkpi "gv'cr0'422: = Dqwej ctf "gv'cr0'3; ; 6+0 Cmj qwi j . "k'j cu'dggp"uwi i guvgt "v j cv'vckpki "uj qwf "dg"tgr rdecv" f c { u'dghqtg" gcej "vkn" *J qr nku"gv'cr0'3; ; ; + "pqv'cm'uwf lgu"o gcuwgf "eqo r rcp"eg"y j kej " o c { "hgc"vq"xctkcvkp"kp"gpgti { "gZR gpf kwtg 0 Cu'c'tguwv"qh" c"pgi cvxg"gpgti { "dcrpeg."v j g" dqf { æ"i n { eqi gp"uwtg" *Vctpq qnm { "gv'cr0'3; ; 8+ "kpuwkp"ugpukxk { "Drcem'gv'cr0'4227+."

cpf "pkxqi gp"dcmpcg" *Dwwgthkgrf "3; : 9+o ki j v'cm'dg"cnrgt gf "ngcf kpi "v"cf f kkpqn'pqlug"kp
 vj g'uwwf { "qweqo gu0'

Rqukxg" gpgti { " dcmpeg" cnq" j cu" o gvdqrke" ko r nccvqpu0' kp" c" uwwf { " r gthqto gf " d { "
 Vctpqr qnm { "et al." *4223+ "kv'y cu'uj qy p" vj cv'vj g'cf f kkp"qh'56' "o qtg"gpgti { " kpenf kpi "
 cp" kpetgcug" kp" ectdqj { f tcvg" kpcng+ " vj" uwdlgevu" j cdkwcn' f kgv' hqt" hqt" f c { u" ngf " vj" c"
 uki pkhecpv'kpetgcug"kp" vj g'dqf { v'i n'eqi gp"eqpegpvcvqpu'd { "39' "cpf "5: ' "kp'hgo cng"cpf "
 o cng"cyj ngvu."tgur gevkg"0'Gpgti { "cpf "o cetqpwtkpv'kpcngu"ctg"vy q"kvgttgrv" f kgvct { "
 eqo r qpqpvo' Y j gp" gpgti { " kpcng" kpetgcugu." o cetqpwtkpv' kpcngu" kpetgcug"
 uko wncpgqwn { 0' Vj g" kpetgcug" kp" vj g" dqf { v' vqcn' i n'eqi gp" ngxgn' j cu" dggp" uj qy p" vj"
 ko r tqxg"gz gtekug"r gthqto cpeg"cpf "cnrgt"r j { ukqmi kcn'tgur qpugu" *Tcwej "gv'cn0'4227+0'K'ku"
 vj gtghqtg"guugpvkn'v"o cng"uwtg"vj cv'uwdlgevu"ctg"cr r tqzko cvgn { "eqpuwo kpi "gpgti { "gs wcn"
 vj" vj gkt"vqcn'gpgti { "gZR gpf kwtg"kp" vj g" f c { u" dghqtg"cp" gZR gtlo gpv'kp" qtf gt"v" r tngxgpv'
 o cunlpi "vj g'uki pcr0'

C"i qqf "cr r tqcej "v"eqpvtqn'gpgti { "kpcng"ku"v" r tqxkf g" r tg/r cemi gf "o gcnu"vj cv'eqxgt"
 r ctvkr cpw'f ckn { "f kgvct { "tgs vkt go gpw'cpf "vj cv'ceeqwpv'hqt" hqf "r tghgtgpegu" *Igeqeng" ("
 Dwtng"4232+0'Vj g"gpgti { "tgs vkt go gpw'qh'gcej "r ctvkr cpv'ecp"dg"guvko cvgf "d { "o gcuwtkpi "
 tguvki "o gvdqrke"tcvg"cpf "r j { uken'cevxxk { 0'F kgv'kpf wegf "vj gto qi gpguku" f qgu'pqv'pggf "v"
 dg"o gcuwtgf "cpf "ku"cr r tqzko cvgn { "7/32' "qh"vqcn'gpgti { "gZR gpf kwtg"kp" r ctvkr cpw'y j q"
 eqpuwo g"cp"cxgtci g"o kzgf "f kgv" *Y guvgtvtr "4226+0'T guvki "o gvdqrke"tcvg"ecp" gkj gt"dg"
 o gcuwtgf "wulpi "kpf kgev'ecnqtko gt { . "uwej "cu" c" xgpvkv" /j qqf "u { ugo "cpf "c" o qwj r kgeg"
 ("pqug/enr "u { ugo " *Tqhg { "gv'cn0'4228+ "qt" r tgf levxg"gs wcvqpu" *Hicpnghkgrf "gv'cn0'4227+0'
 Rj { uken'cevxxk { "ecp"dg"guvko cvgf "wulpi "uwdlgevxg"o gvj qf u" *g0'0r j { uken'cevxxk { "f kct { = "
 Kcs "4224+ "qt" o gcuwtgf "wulpi "qdlgevxg"o gvj qf u" *g0'0ceegrtqo gvtu= "Y guvgtvtr "3; ; ; = "
 Guqp"gv'cn0'3; ; : +0' Cp"cnrgtpcvxg"o gvj qf "v" o gcuwtg" f kgvct { "tgs vkt go gpw'wugf "d { "uqo g"
 tgugctej gt u'eqpuku"qh"r gthqto kpi " gkj gt "c" f kgvct { "tgecm" *F tgecm+ "qt" c" Hgeqtf "v" guvko cvg"
 uwdlgevu" wuwn' gpgti { " kpcng" cpf " vj gp" r tgr ctg" vj g" r tg/r cemi gf "o gcnu" ceeqtf kpi n' "
 *O qpecf c/Iko gpgl " gv' cn0' 422; +0' P gxgtvj gruu. " vj ku" o gvj qf " ecp" wpf gtguvko cvg" gpgti { "
 kpcng" d { "cr r tqzko cvgn { "42' " *J qy cv'gv'cn0'3; ; 6+ "vj gtghqtg. 'kv'ku'pqv'tgeqo o gpf gf 0'

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1.2.2 Carbohydrate

Vj gtg'ku'c'rtci g'xqmw g'qh'r wdrkuj gf "uwf lgu'f guetkdkpi 'y g'ko r cev'qh'f kgvct { "ectdqj { f tcvg" o cplr wv'kqp"qp"o wueng"i n{eqi gp" *O cf ugp"gv'crf'3; ; 2="Dquej "gv'crf'3; ; 5="Tcwej "gv'crf'3; ; 7+" gpf wtcepg" r gthqto cpeg" *J cy rg{ " gv' crf' 3; ; 9=" Eqttgk/Qrkxgkc" gv' crf' 4235=" Gtrgpdwuej "gv'crf'4227="Lqj puqp"gv'crf'4228+."pwtkgpv'qz kf c'kqp" f wt'kpi "gzgtekug"*Mrcxu" O cf ugp"gv'crf'3; ; 2="Rkukrcf ku"gv'crf'3; ; 8+."drqkf "i nwequg"rgxgnu"*Dkuj qr "gv'crf'4223d+." kpuwrk"cev'kqp"*Drcen'gv'crf'4227+."cpf "rk kf "r tqhkg"*O wqkq"gv'crf'3; ; 6+0'Qxgtcm"uwf lgu" j cxg'tgr qtvgf "ko r tqxgf "gpf wtcepg"r gthqto cpeg"kp"hxqwt"qh'yj g"ectdqj { f tcvg"tlej "f kgv" *QdMgghg"gv'crf'3; ; : ; ="Eqttgk/Qrkxgkc"gv'crf'4235+0'Vj g"equwo r kqp"qh'ectdqj { f tcvg" tlej " f kgv" kpetgcugu"i n{eqi gp" rgxgnu" kp" ungrgvcn' o wuengu." yj g" rtko ct { " ecwug" hqt" yj g" ko r tqxgo gpv'kp"gpf wtcepg"r gthqto cpeg"*Tcwej "gv'crf'4227+0'Hqt"gzco r rg."Tcwej "gv'crf' *3; ; 7+"lpxguki cvgf "yj g"ghge'v'qh'j ki j "ectdqj { f tcvg" f kgv"*320'i 0ni ^{/3}"DO "r gt" f c { "+"versus" pqto cn' ectdqj { f tcvg" f kgv" *80" i 0ni ^{/3}" DO " r gt" f c { "+" qp" o wueng" i n{eqi gp" rgxgn' cpf " gpf wtcepg"r gthqto cpeg'Qp" y q"ugr ctcvg"qecucukpu." y g'rg" y gm'v'ckpgf "o cng"e { erkuu" equwo gf "kp" c' t'cpf qo "qtf gt"qpg'qh'yj g"y q" f kgw'hqt"yj tgg'f c { "u'dghgtg"eqo r ngv'kpi "c'r t g/ r'qcf gf "ko g"v'kcn'rcu'kpi "yj tgg"j qwtu'0'Rctv'kcr cpw'e { engf "hqt"y q"j qwtu'cv'¢97" "XQ4r gcm' kpvgtur gtugf "y kj "h'xg"82"ugeqpf u'ur t'kpw'cv'XQ4r gcm'cv'o kpwgu42."62."82." : 2."cpf "322" hqmuy gf "d { "c'qpg'j qwt'ko g"v'kcn'kpetgcukpi "ectdqj { f tcvg"kpvcng'tguwngf "kp"69" "kpetgcug" kp"o wueng"i n{eqi gp'0'O gcp"r qy gt"qwr w'y cu"j ki j gt" f wt'kpi "yj g"ko g"v'kcn'chgt" c"j ki j " ectdqj { f tcvg" f kgv"*455"Y +eqo r ctgf "vq"pqto cn'ectdqj { f tcvg" f kgv"*437"Y +0'O cf ugp"gv'crf' *3; ; 2+"h'wpf "yj cv'yj g"equwo r kqp"qh'c" ectdqj { f tcvg" gptlej gf " f kgv" kpetgcugf "o wueng" i n{eqi gp"uxqtgu'd { "47' 0'Vj g"tgur ktcvqt { "gzej cpi g"tcv'kq"y cu"uki p'k'k'ecpwn' "j ki j gt"cv'tguv" cpf "f wt'kpi "gzgtekug"chgt" c"j ki j "eqo r ctgf "vq"pqto cn'ectdqj { f tcvg" f kgv'0

O quv'r ctv'kcr cpw'kp" rcdqtcvqt { "cpf "h'grf "uwf lgu"kp"ur qtv'cpf "j wo cp"pwt'k'kqp"ctg"htgg" r'k'k'pi "l'gceqeng"("Dwtng"4232+0'F kgvct { "kpvcng"qh'htgg"r'k'k'pi "r ctv'kcr cpw'ecp"xct { "htqo " f c { "vq" f c { "f wg"vq"ej cpi gu'lp"yj gk" f c'k'k' "r'k'g'u'v'rg"*g'0'0'f c'k'k' "r j { u'k'cn'cev'k'k'k'="Rgrn'rx" a "gv" crf'4232+"cpf "pcwtcn'r j { uk'q'qi k'cn'ld'k'q'qi k'cn' xct'k'v'k'p'u'0'Hqt" gzco r rg." yj g" f c { "/vq/f c { " xct'k'cd'k'k'v' "qh'r'ncuo c"i j t'gr'k'p"eqpegp'v'k'k'p."cnuq"npqy p"cu"yj g"j vpi gt"j qto qpg."ku'¢"; ' " *J cpugp"gv'crf'4224+0'Dkpi j co " *3; ; 9+"tgxgcngf "yj cv'yj g" f c { "/vq/f c { "xct'k'cd'k'k'v' "kp"gpgti { " cpf "ectdqj { f tcvg"kpvcng"ku"45' 0'Vj gtghgtg." yj g"cdugpeg"qh'f kgvct { "ucpf ctf k'v'k'k'p"ecp" rgcf "vq"y kf g"xct'k'v'k'p'u'kp" f kgvct { "kpvcng"dgw ggp"v'k'cn'0'Uqo g"r ctv'kcr cpw."hqt"gzco r rg." o ki j v'equwo g"622"i "qh'ectdqj { f tcvg" yj g" f c { "dghgtg" yj g"htuv'v'k'cn'cpf "722"i "dghgtg" yj g"

ugeqpf 0Vj gug'r ctvlekr cpw'o c{ "gZR gtLgpeg"ko r tqxgo gpw'kp'r gthqto cpeg"cpf "cp"lpetgcug"
 kp'i n{eqi gp"rgxgnu"kp"vj g"ugeqpf "tkcn'eqo r ctgf "vq"vj g'htu0Dwuucw'cpf "eqmgci wgu"*4224+ "
 uj qy gf "vj cv"lpetgculpi "ectdqj { ftcvg"kpvcng"vq"32"i 0ni ^{/3}"DO "hqt"46/j qwtu"ku"gpqwi j "vq"
 ucwtcvg"i n{eqi gp"rgxgnu"kp"ungrgvci'o wuergu0Vj g"eqptct { "ku"cuq"vtwg0Dgti utqo "gv'cr0'
 *3; 89+" f go qpwtcvgf "vj cv"uvtvki "vj g"tkcn'y kj "82/: 2' "rguu"i n{eqi gp"rgf "vq"¢"72' "
 ko r ckto gpv"kp"gpf wtcepg"r gthqto cpeg0K'ku"vj gtghqtg"guugpvkn"vq"eqptqn"ectdqj { ftcvg"
 kpvcng"ht "cv'rgcu/46/j qwtu'dghqtg"gzr gtlo gpvci'tkcn0'

Uwf lgu"vj cv'wug"cr tg/gzgtekg"o gcu"uj qwf "o cng"uwtg"vj cv"vj g"o gcu"ctg"ucpf ctf kugf "
 dgw ggp"tkcn0Hqt"gzco r rg."O eNckp"gv'cr0'*4237+"gpeqwtci gf "r ctvlekr cpw"vq"eqpuwo g"cr "
 ugrh/ugrgvgf "r tg/gzgtekg"o gcu"uko krt "kp"gpgti { "cpf "o cetqpwtlpgv'eqpvpgv."r tkqt "vq"gej "
 tkcn0Vj g"eqpegtp"ku'y kj "rgcxkpi "r ctvlekr cpw"vq"ej qqug"vj g"v{r g"cpf "s wcpvk{ "qh'hqqf "cv"
 gcej "o gcu'y j lej "o c{ "pqv'dg"kf gpvlecn0Cunkpi "uwdlgeu"vq"gcv'o gcu'y kj "uko krt "gpgti { "
 cpf "o cetqpwtlpgv' eqpvpgv" o c{ "pqv" dg" uwhlekgp" gur gekm{ "kh" vj g{ "neni' pwtkkqp"
 npqy rgi g0J qy gxgt."vj g"tgugctej gtu"qh"vj ku'uwf { "f kf "eqmgev'hqqf "f kctku'y j lej "cmqy gf "
 vj go "vq"r ctvlecn{ "ej gen'hqt"eqo r rLcepg0Tugctej gtu"uj qwf "cuq"dg"cy ctg"qh"vj g"ghgev"qh"
 f khtgpv'o gcu'eqo r qukkqp"qp"r j { ukqni lecn'cpf "dkqni lecn'o ctngtu"cpf "ej qqug"vj g"qpg"
 vj cv'o quv'uuku"vj gk "kpvtxgpkqp0Hqt"gzco r rg."ectdqj { ftcvg"tkej "o gcu'eqpuwo gf "j qwtu"
 dghqtg"cp"gzr gtlo gpvci'tkcn'ecp"cngt "uwdutcvg"wug"cpf "ko r tqxg"gpf wtcepg"r gthqto cpeg"
 y j gp"i n{eqi gp"uqtgu"kp"vj g"dqf { "ctg"uwdqr vko cn'eqo r ctgf "vq"qr vko cn'*Uj gto cp"gv'cr0'
 3; ; ; =P gwhgt"gv'cr03; ; 9+0'

Vj g"cr r tqcej "vq"ucpf ctf kug"ectdqj { ftcvg"kpvcng"ku"uko krt "vq"gpgti { "*ugg"ugevkkp"30403+0'
 Vj g"dguv"cr r tqcej "ku"vq"r tqxkf g"r tg/r ceni gf "o gcu"*Lgceqeng" ("Dwtng"4232+0' Rt g/
 gzgtekg"o gcu"uj qwf "r tghgtcdn{ "dg"r tqxkf gf "d{ "tgugctej gtu"kp"qtf gt "vq"gnko kpcvg"vj g"
 rkngkj qqf "qh'eqpuwo kpi "urki j v{ "f khtgpv'o gcu"dghqtg"gej "tkcn'd{ "r ctvlekr cpw0Kp"uqo g"
 uwf lgu."tgugctej gtu"o ki j v'o cplk wrcvg"ectdqj { ftcvg"kpvcng"ugxgtcn'f c{ u'dghqtg"gej "tkcn"
 *Ectg{ "gv'cr0'4223="Y cmgt"gv'cr0'4222="J qtxcvj "gv'cr0'4222+0'Ectdqj { ftcvg"tgs wktgo gpw"
 eqwf "dg"ecrewrcvgf "gkj gt "vulpi "c"r gtegpvi g"qh"vj g"qvci"gpgti { "kpvcng"qt "dcugf "qp"
 r ctvlekr cpw"dqf { "o cuu"*i 0ni ^{/3}"DO +*Rtkej ctf /Rguej gni'gv'cr0'4232="O vqlq"gv'cr03; ; 6+0'

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"

"

1.2.3 Fluid

C"eqpukf gtcdrng" co qwpv" qh" rkgtcwtg" j cu" dggp" r wdrkuj gf" kpxguki c\kpi " vj g" ghgeev" qh" f gj { ftcv\kqp" qp" gpf wtcpeg" r gthqto cpeg0 Vj gug" uwf kgu" tggxgcrgf " vj cv" j { r qj { ftcv\kqp" qh" o qtg" vj cp" 4' "dqf { "o cuu" j cu" c" f g\kto gpvcn' ghgeev" qp" gpf wtcpeg" r gthqto cpeg" k\ "go r gtcvg" cpf" j qv" gp\k\kqpo gpw" *Ej gwxtqp\ gv' cr0 4225= Cto utqpi " gv' cr0 3; : 7= Mepghkem" gv' cr0 4232= Ej gwxtqp\ gv' cr0 4227= Ej gwxtqp\ " Mepghkem" gv' cr0 4232+0J qy gxgt. " vj g" lo r c\kto gpv" k\ " cgtqdle" r gthqto cpeg" ku" o wej " o qtg" r tqpqwpegf " k\ " j qv" gp\k\kqpo gpw" eqo r ctgf " v\ " eqrf 0' Hqt" gzco r ng. " j { r qj { ftcv\kqp" qh' 6' " DO " lo r c\ktu" v\o g" v\kcn' e { enkpi " r gthqto cpeg" d { " 5' " cv" 32" ÅE. " 7' " cv" 42" ÅE " cpf " d { " 45' " cv" 62" ÅE " *Mepghkem" gv' cr0 4232+0J { r qj { ftcv\kqp" d { " 5' " DO " y cu" cuu" q" uj qy p" v\ " pgi c\kxgn { " lo r c\k\ " r tg/ mcf gf " v\o g" v\kcn' r gthqto cpeg" *u\gc f { " u\cvg" r j cug" hqmuy gf " d { " c" v\o g" v\kcn' v\cum" d { " c" : ' " cv" 42" ÅE " *Ej gwxtqp\ gv' cr0 4227+0J { r qj { ftcv\kqp" qh' 4' " cpf " 6' " eqpugs wgpv\ " tgf weg f " y cmkpi " v\o g" v\ " eqo r ngv\k\p" v\cum" k\p" j qv" eqpf k\kqpu" d { " 44' " cpf " 6: ' " *Etckl " (" Ewo o kpi u" 3; 88+0Hwt vj gto qtg. " Cto utqpi " et al." *3; : 7+ " uj qy gf " vj cv" vj ngvu" r gthqto gf " uki p\k\ecpv\ { " y qtug" k\p" 7222/ " cpf " 32222/ o " twppkpi " gxgpw" *8' " unqy gt+ " y j gp" vj g { " y gtg" j { r qj { ftcvgf " r tg/ gz gtekug" d { " f k\vg\k\eu" d { " 4' " qh' vj gk\ " DO 0'

J { r qj { ftcv\kqp" j cu" cuu" dggp" uj qy p" v\ " tgf weg" o cz\o cn' qz { i gp" qwr w" *XQ4o cz+ " *Ucy n\ " 3; : 4= P { dq" gv' cr0 4223+0P { dq" et al. " v\guv f " vj g" ghgeev" qh' j { r qj { ftcv\kqp" qp" XQ4o cz " k\p" dq vj " y cto " cpf " v\o r gtcvg" eqpf k\kqpu 0Ukz " gpf wtcpeg" v\ckp gf " e { enk\ u" eqo r ngv f " c" o cz\o cn' gz gtekug" v\guv" *KQ0 kpetgo gpvcn' v\guv" wpv\k\ g\z j cwukqp+ " gwj { ftcvgf " cpf " cpq vj gt" j { r qj { ftcvgf " *6' " DO + " k\p" gcej " co d\kpv" eqpf k\kqp 0Vj g" tguw\ u" uj qy gf " vj cv" XQ4o cz " y cu" tgf weg f " d { " 8' " cpf " 38' " y j gp" j { r qj { ftcvgf " uwdlgeu" r gthqto gf " k\p" v\o r gtcvg" cpf " y cto " eqpf k\kqpu. " tguv g\kxgn { . " eqo r ctgf " v\ " gwj { ftcvgf " k\p" v\o r gtcvg" eqpf k\kqp 0Vj gtghqtg. " uj qy kpi " wr " j { r qj { ftcvgf " v\ " vj g" r tgn\o k\pct { " v\guv kpi " qh' c" uwf { " *XQ4o cz " v\guv+ " ecp" cff " pqkug" v\ " vj g" xcn\gu" qdv\k\p gf " chgeev kpi " vj g" k\pvgpuk\ { " qh' vj g" g\z r gt\o gpvcn' v\kcn' *KQ0 uwdlgeu" y kn' dg" r gthqto kpi " cv' c" hqy gt " y qtnltcvg+0"

Hwt vj gto qtg. " j { r qj { ftcv\kqp" ecp" tgf weg" r n\uo c" xqn\wo g" y j lej " lo r c\ktu" dqf { \u' cdkk\ { " v\ " v\cpuhgt" vj g" j gcv" i gpgtcvgf " d { " vj g" y qtnkpi " o wuergu" v\ " vj g" un\k\p " *Pcf gn' 3; : 2+0J { r qj { ftcv\kqp" d { " 4/6' " tgf wegu" r n\uo c" xqn\wo g" d { " wr " v\ " 32' " *Ej gwxtqp\ " Mepghkem" gv' cr0 4232+0Vj ku" ngcf u" v\ " c" tgf wev\kqp" k\p" j gcv" n\quu" cpf " vj gtghqtg" c" t\ug" k\p" eqtg" dqf { " v\o r gtcwtg" *Ocw j cp" 4225+0K' j cu" dggp" f go qpustcvgf " vj cv" eqtg" dqf { " v\o r gtcwtg" kpetgcugu" d { " 2087" v\ " 204 ÅE" hqt" gxgt { " 3' " n\quu" qh' DO " *Oqpvc\k\p" (" Eq { ng" 3; : 4+0

J {r qj {f tcvkqp "cnuq" ecwugu" tgf wekqp" kp" utqng" xqno g" *I qp| a rg| /Cmpuq" gv' crf' 4222+ " tgf wekqp" kp" ectf kce" qwr ww" *I qp| a rg| /Cmpuq" gv' crf' 3; ; 7= O qpvc kp" gv' crf' 4229+ " cpf " gngxcvug" j gctv' tcvg" *O qpvc kp" ("Eq{ ng" 3; ; 4+0Vj g' tkug" kp" j gctv' tcvg" ku' ctqwpf "5/7" dgcw' r gt" o kpwg" hqt" gxgt { "3' "quu" qh' DO 0'I qp| crg| /Cmpuq" cpf "eqmgci wgu" *3; ; : + "tgxgcngf" yj cv' dmqqf "hny "vq" y qtnkpi "o wueng" y cu' f getgcugf "kp" j qv' eqpf kkpup" *57AE +y j gp' uwdlgeu' y gtg" j {r qj {f tcvgf 0'O qtgxgt. "i n{ eqi gp' wkkucvqp" kpetgcugf "f wtkpi "gz gtekug" kp" j {r qj {f tcvgf " uwdlgeu" y j lej " eqwrf" r ctvkm{ " gznckp" yj g" tgf wekqp" kp" gpf wtcepg" r gthqto cpeg" *J cti tgcxgu" gv' crf' 3; ; 8+0"

J {r qj {f tcvkqp" ku" o qtg" eqo o qp" co qpi u' vj ngvu" yj cp" r tngxkwun{ " yj qwi j v0T guwmu" t qo " wy q' uwf lgu" yj cv' o qpksqtf " j {f tcvkqp" uvcwu" qh{ qwpi "WU" cpf "Gwtqr gcp" vj ngvu" tngxgcngf " yj cv' o qtg" yj cp" 82' "qh" vj ngvu" cttkxgf "vq" vckpki "crtgcf { " j {r qj {f tcvgf " *Rj knk u" gv' crf' 4236= "Xqr g" gv' crf' 422; +0Vj gug' uco g" vj ngvu" eqwrf "cnuq" wtp' w' j {r qj {f tcvgf "vq" tgugetej " uwf lgu0T gugctej gtu' uj qwf "r c{ "enugt" cvgpvqp" vq" j {r qj {f tcvkqp" cpf "pggf "vq" o cng" uwtg" yj cv' uwdlgeu" ctg' uctvki "gcej "vcknkp" c" gwj {f tcvgf "uvcg0"

Tgugctej "r ctvckr cpw" ecp" dg' i kxgp' kputwekpu" vq" eqpuwo g" c' ur gekke" xqno g" qh' y cvgt" yj g" gxgkpi "dghqtg" yj g" vckn" *g0 0'722" o n0Hwtj gto qtg. "wr qp" yj gkt" cttkcn" vq" yj g" ndqtcvt { . " y cvgt" ecp" dg" r tqxkf gf "hqt" yj g" r ctvckr cpw" j qwtu" dghqtg" c" vgu0Uwf lgu" wuwm{ "r tqxkf g" dgwy ggp" 472" cpf "722" o N" qh' y cvgt. "62" vq" 342" o kp" dghqtg" yj g" vgu" *Uj ktghu" gv' crf' 4226= " Rqr qy unk" gv' crf' 4223= "Qr r nki gt" gv' crf' 4227+0' k" uqo g" ecugu. "yj g" co qwpv' qh' y cvgt" ku' dcugf " qp" r ctvckr cpw" dcf { "o cuu" *g0 09" o r0mi ^{/3} "DO = "Ucej gphgrf "gv' crf' 4222+0Vj ku" j gnr u" gpwtg" yj cv' uwdlgeu" ctg' kp" c" gwj {f tcvgf "uvcg" r tkqt "vq" yj g" gznckp gpvcn' vckn" *Uqmpgm' gv' crf' 4233+0' J qy gxgt. "yj ku' y kn' cf f "dwtf gp" qp' tgugetej gtu' d{ "gz vgpf kpi "yj g' f wcvkqp" qh' gcej "vckn' d{ "cp" cf f kkpncn' 4" j qwtu" kp" qtf gt" vq" cf o kpvgt" y cvgt0Vj ku' r tqdngo "eqwrf" dg" qxgteqo g" d{ " kputwekpi "r ctvckr cpw" vq" eqpuwo g" yj g" ur gekkef "co qwpv' qh' y cvgt" cv' j qo g" dghqtg" yj gkt" cttkcn" vq" yj g" ndqtcvt { "cpf "yj gp" o gcwrtg" eqo r ckpeg" d{ "cuugukpi "yj gkt" j {f tcvkqp" hgxgr0" "

1.2.4 Caffeine

Echhkgp" ku" c" egpvcn' pgtxqu" u{ ugo "uko wrpv" hqwpf "kp" eqhgg. "vgc. "uqlh" f tkpmu. "cpf " ej qeqrvg0' K' ku' y kf gn{ "eqpuwo gf "d{ " yj g" i gpgtcn' r qr wcvkqp" cu" eqhgg" cpf "d{ " vj ngvu" gkj gt" cu" eqhgg" qt" cu" ur qt' v' uwr r ngo gpw' eqpvckpki "echhkgp0' Echhkgp" j cu" dggp" uj qy p" vq" gpj cpeg" r j {vckn' r gthqto cpeg" *F gudtqy "gv' crf' 4234= "I cplq" gv' crf' 422; = "I gpnkpu" gv' crf'

422: +!kp" c"y kf g"tcpi g"qh"gz gtekug"v{ r gu"cpf "f wt cvkpu" *I tcj co "4223=Dwtng"422: +0Hqt" gzco r ng."c"qpqg/j qwt"e{enkpi "vko g"vkcni'r gthqto cpeg"y cu"uki pkhecpv{ "ko r tqxgf "d{ "60+ " chgt" yj g"equpuwo r vkp"qh"5"o i 0ni /3"qh"echhgkpg"eqo r ctgf "vq" r rnegdq" *F gudtqy "gv"crf 4234+0K'y cu"gxgp"tgxgcrgf "yj cv"yj g"gti qi gple"ghge"vqh"echhgkpg"eqwrf "dg"qdugt xgf "wr "vq"8" j qwtu"chgt "ku"equpuwo r vkp"d{ "pqp wugtu" *Dgm{ "O eNgmcp"4224+0Vj ku"y km"uki pkhecpv{ " chge"v vkcni" cpf " r tgrko kpct{ " vguu" eqpf wevgf " r vgt" f wtkpi " yj g" f c{ " kp" ecugu" y j gtg" r ctvkr cpw{ j cxg"equpuwo gf "eqhgg"qt"cp{ "qyj gt"echhgkpcvgf "r tqf wev"kp"yj g"o qtplpi 0"

Vj g"o gej cpkuo "dgj kpf "j qy "echhgkpg" gpj cpegu"gz gtekug"ecr cekv{ "ku"vkm"pqv{ {gv"hw{ " wpf gtuxqf 0Vy q"qh"yj g"o ckp"o gej cpkuo u"r tqr qugf "ctg<3+"yj g"dmqenci g"qh"cf gpqulpg" tgegr vqtu" cpf " 4+" yj g" vko wrcvkp" qh" yj g" egpvcni' pgtxqwu" u{vgo " *I tcj co " 4223= Vctpqr qnm{ "422: +0Cf gpqulpg"tgegr vqtu"ctg"hwpf "kp" c"pwo dgt"qh"egm'o go dtcpgu"kp"yj g" j wo cp" dqf { " kpenw kpi " yj g" dtckp." cf kr qug" vkuwgu." cpf " ungrvcni'o wuergu' F wg" vq" yj g" uko kctk{ "qh"echhgkpg" vq" yj g" utwewt g" qh" cf gpqulpg."k" dlpf u" vq" cf gpqulpgau" tgegr vqtu" tguwv kpi "kp" yj g"dmqenci g"qh"ku"cev kpi" *I tcj co "4223+0Vj ku"tguwv kpi" cp" kpetgcug" kp" r ruo c"htgg"hw{ "cekf u" cpf "hcv" qz kf cvkpp" f wtkpi "gz gtekug"rgcf kpi "vq" i n{eqi gp"ur ctkpi " y j lej "eqwrf "gzr mcp"yj g" f gnc{ "kp"hw{ v w" *K{ "gv"crf 03; 9; =Gtlemup"gv"crf 03; 9; =Eqvkm"gv" crf 03; 9; +0C"pqv"qh"ecwvkp"ku" f wg"j gtg"ulpeg"yj g"tguwv"ctg"vkm'eqphkvpki 0O qtg"tgegpv" uwf lgu"hwpf "eqpvcf kvpki "hkp kpi u" y kj "pq" ghge"vqh"echhgkpg" qp" hcv" qz kf cvkpp" cpf " yj gtghqtg" f q"pqv"uwr r qtv"yj g"cdqxgo gpvkppgf "j {r qyj guku" *I tcj co "gv"crf 04222=Newtgpv"gv" crf 04222=I tcj co "gv"crf 0422: +0Kp"j ku"tgxky ."I tcj co " *4223+"o gpvkpu"yj cv"kp"34"uwf lgu" eqpf wevgf "kp"j ku"mdqtcvqt{ ."qpni "ukz" qdugt xgf "cp" kpetgcug"kp"ekewrcv kpi "htgg"hw{ "cekf " r g xgu"cpf "y cu'o ckpn{ "cv'tguv'dghqtg"yj g"vuctv"qh"yj g"gz gtekug 0J g"cf f gf "yj cv"yj g'tgur ktcvqt{ " gzej cpi g"tcvkq" *TGT +!kp"cm"34"uwf lgu"y cu"pqv'tgf wegf ."y j lej "tghgeu"yj cv"hw{ qz kf cvkpp" y cu"pqv" kpetgcugf 0I tcj co "cpf "eqmgi wgu" *4222+"cti wgf "yj cv'r t g xkwu"uwf lgu"o gcuwtf " hcv"o gxcdqrkuo "o ckpn{ "wukpi "c"eqo dlpvcvkp"qh"vy q"o gvj qf u"r wv qpct{ "cpf "o gxcdqrk" o gcuwgo gpw"lpugcf "qh"gzco klpki "yj g"cevkg"o wuerg 0Vj gtghqtg."yj g"cwj qtu"uwf kgf "hcv" o gxcdqrkuo "kp" yj g"cevkg"o wuerg"qh" vgp"o crg" uwdlgew"e{enkpi "hqt" qpq"j qwt" cv"92" " XQ4o cz0'Dmqf "uco r rnf "y gtg"eqmgevgf "htqo "hgo qtcni'ctvgt{ "cpf "xgkp"qh"qpq"rgi "vq" o gcuwtf"yj g"wr veng"cpf "tgrgcug"qh"ugxgtcn'dkqo ctngtu"d{ "yj g"cevkg"rgi 0O wuerg"dkqr ukgu" y gtg"vengp"dghtg."vgp"o kpwgu"chgt"yj g"vuctv"cpf "gpf "qh"yj g"gz gtekug 0Cmj qwi j ."echhgkpg" tguwv kpi "kp"cp" kpetgcug"kp" r ruo c"hw{ "cekf u"cpf "i n{egtqn'cv'tguv'eqo r ctgf "vq" r rnegdq."pq" cngtcvkp"y cu"qdugt xgf "kp"rgi "i n{egtqn'tgrgcug"qt"hw{ "cekf "wr veng" f wtkpi "gz gtekug"chgt" echhgkpg" kpi guvkp0"

Vj g"ugeqpf "j { r qvj guku'tgxgcu"vj cv"vj g"gti qi gple"ghgeV"qh'echhgkpg"ku"fv"vq"ku"cdkxv{ "vq" uko wcvg"vj g"egpvcn'pgtxqwu"u{ ugo "d{ "kpetgculpi "r clp"cpf "r gtegxgf "gzgtvqp"vj tguj qrf u" *Vctpqr qnum{ " 422: +0' Hqt" gzco r rg." I tej co " et al." *4222+" tgr qtvgf " cp" kpetgcug" kp" u{ o r cvj gvk"pgtxqwu"u{ ugo "cevkxv{ "hqmy kpi "echhgkpg"lpi gukqp0'K"j cu"tgr gcvgf n{ "dggp" uj qy p"vj cv'echhgkpg"tgf wegu"vj g"tcvg"qh'r gtegxgf "gzgtvqp"fvtkpi "gzgtekg" *Fqj gtvl{ (" Uo kj "4227+"y j lej "r m{ u"u"uki pkhecpv'tqrg"lp"vj g"gpj cpego gpv'qh'gpf wtcpeg'r gthqto cpeg" *Dwtng"422: +0'Fqj gtvl{ "cpf "Uo kj "hwpf "vj cv'echhgkpg"ecp"uki pkhecpv{ "tgf weg"TRG"d{ " 708' "fvtkpi "gzgtekg"eqo r ctgf "vq'r megdq0'

Vj g"eqo o qp"cr r tqcej "vq"o kko kug"vj g"ghgeV"qh'echhgkpg"ku"vq"cxqkf "ku"eqpuwo r vqp"46/ j qwtu"dghqtg"vj g"gzr gto gpv" *Tcvrkhh"gv"cn0'4233+0'Nqpi gt "cdvkgpgpeg" *6: "j qwtu"wr "vq" c" y ggm"o c{ "dg"tgs vktgf "kp"ecugu"y j gtg"echhgkpg"ku"r ctv'qh"vj g"kvgtxgpvqp" *O qv'gv'cn0' 4228="Cuqtkpq"gv'cn0'4233+0'Tgugctej gtu'ecp'r tqxkf g" c"kuv'qh'hqf "cpf "f tkpmu"vj cv'eqpvclp" echhgkpg"vq"j gr "uwdlgeu"cxqkf "echhgkpg0'Eqo r kcepeg"eqwf "dg"vgugf "d{ "o gcwtkpi "r mco c" qt "vklpg"echhgkpg"eqpegpvcvqpu" *Xcp "Vj w{ pg"gv'cn0'4227+0"

"

1.2.5 Alcohol

Uwtxg{ u"uwej "cu"vj cv'eqpf wevgf "d{ "Rqr qxc"et al." *4229+"uj qy gf "vj cv'cr r tqzko cvgn{ "34"N" qh'r vtg"creqj qnly cu'eqpuwo gf "r gt"ecr kc"lp"vj g"WMlp"4224. "y j krg vj g"Qthleg"htq'P cvkqpcn' Ucvkukcu" *422: +" tgr qtvgf "vj cv"o qtg"vj cp"42' "qh"o gp"ctg"eqpukf gtgf "j gcx{ "f tkpntu" *eqpuwo r vqp"qh"@: "wpku"qh'creqj qn'cv'ngcu'qp"gf c{ "r gt"y ggm0'Qp"vj g"qvj gt"j cpf ."vj g" cxgtci g"co qwpv'qh'creqj qn'eqpuwo gf "r gt"y ggm'd{ "cvj ngvu"ku"36"Ö7"wpku0'K"ku"r quklrg" vj cv' vj g"ug" cvj ngv" cpf "ppp/cvj ngv" f tkpntu" o c{ " gpf " wr " r ctvlekr cvkpi " kp" c" uwf {0' Tgugctej gtu'uj qwf "vj gtghqtg"r c{ "enugt"cwgpvqp"vq"creqj qn'eqpuwo r vqp"d{ "r ctvlekr cpw" f vtkpi "vj g" uwf {0' Rtgxkqwu" uwf kgu"j cxg" tgr qtvgf "c" f gvko gpvcn' ghgeV"qh' creqj qn' qp" gpf wtcpeg" r gthqto cpeg" *O eP cwi j vqp" (" Rtgggeg" 3; : 8=" Ngeqwm"tg" (" Uej w{ " 422; =" Mepf tlen'gv'cn0'3; ; 5="Qdtkp"3; ; 5+0'Vj g"co qwpv'qh'gy cpqn'kpi guvgf "kp"gej "qh"vj g"ug" uwf kgu"ku"r tgugpvf "kp"Vcdng"30'0'Ngeqwm"tg"cpf "Uej w{ " *422; +"o gcwtkgf "r qy gt"qwr w" f vtkpi "c"82/o kpwg"e{erkpi "vko g"vken'chgt"lpi gukpi "i tcr ghtvkl'lwleg"y kj "qt"y kj qw" gj cpqn'd{ "35"y gm/vtkp"gf "o crg"e{erkwu0'Rqy gt"qwr w'y cu"uki pkhecpv{ "tgf wegf "kp"vj g" creqj qn'vken'd{ "50 ' 0'K'uj qwf "dg"pqvgf "vj cv'i mequg"qzkl cvkqp"tcvg"y cu"cuq"tgf wegf "d{ "

35' 0'Hwtvj gto qtg."Mgpf tlem'et al."*3; ; 5+"f go qpwtcvgf "cp"lpetgcug"kp"j gctv"tcvg"cpf " qz {i gp"wr vcnq'hqmqy kpi "gyj cpqnlkpi gukqp0"

Vj g"o quv"utknkpi "hkf kpi "eco g"htqo "c"uwf { "r wdkuj gf "d{ "QdDtlgp" *3; ; 5+"y j gtg"j g" f go qpwtcvgf "vj cv"vj g"f gvtko gpvcn'ghge'v'qh"creqj qn'qp"gpf wtcepg"r gthqto cpeg"eqwv"dg" qdugtvgf "gxgp"46/j qwtu"chgt"ku"equwo r vkp."npqy p"cu"vj g"j cpi qxgt"ghge'v'qh"creqj qn' Hhggp"ugpqt"twi d{ 'r n{gtu'y gtg"i kxgp"o qpg{ "cpf "lphqto gf "vq"ftkpm'vj gk "uwcn'co qwpv' qh"creqj qn'qp"c"pki j v'qww'y kj "vj gk"r ggto0'Vj gtg"y cu"pq"tgutlvkqp"qp"vj g"co qwpv'qh" creqj qn'vj cv"eqwv"dg"equwo gf 0'P gzv'fc{."uwlgeu"tgr qtvgf "creqj qn'kpvcng" xct{ kpi " dgvy ggp" 3" cpf " 5: " wpku0' T guwru" uj qy gf " c" i tqwr " o gcp" tgf wevkqp" kp" gpf wtcepg" r gthqto cpeg"qh"3306' 0'Vj gug"tguwru"ko r n{ "vj cv'uwlgeu"uj qwv"dg"tgo kpf gf "vq"cxqkf " equwo kpi "creqj qn'vj g"gxgpkpi "dghqtg"vj g"gzr gtko gpvcn'vkcnu0'Enqut "cvwgvkqp"uj qwv"dg" i kxgp"y j gp"f gcnkpi "y kj "cyj ngvu"cu"uqekcn'f tlpnkpi "y kj kp"vj ku"i tqwr "qh'uwlgeu"ku"j ki j n{ " eqo o qp"ctqwpf "gxgpkpi "vko g."vj g"tcvg"tcpi kpi "dgvy ggp"3: "cpf": 6' "f gr gpf kpi "qp"vj g" v{r g"qh"ur qtv"QdDtlgp"("N{qpu"4222-0'Hqt"gzco r ng."vj g"j ki j guv'r gtegpvc i g"qh'ftkpngtu" y j q"equwo g"creqj qn'cpf "vtckp leqo r gvq"pgzv'fc{ "j cxg"dggp"uggp"kp"etkengv"twi d{."cpf " i cgnk"hqqvdcn": 6' ."97' ."cpf "97' ."tgr gevkggn{ +0'Vgco "ur qtu"uwej "cu"hqqvdcn'cpf " dcungvdcn'j cxg'urki j v{ "mqy gt'r gtegpvc i g"qh'ftkpngtu"*87' "cpf "8: ' ."tgr gevkggn{ +0'Vj gug" hki wtgu'r tqxkf g"ci qqf "kfgc"cdqwy j qo "vq"rc{ "cvwgvkqp"vq"y j gp"eqpf wevkpi "c"uwf { 0'Hqt" gzco r ng."tgugctej "uwf kgu"qp"twi d{ "r n{gtu"o c{ "pggf "vq"ko r ngo gpv'gzv"o gcwv"gu"*gd 0' o gcwv"gu"creqj qn'kp"wtkpg+"vq"o cng"uwtg"vj gk "uwlgeu"j cxg"cxqkf gf "creqj qn'vj g"pki j v' dghqtg"vj g"gzr gtko gpvcn'vkcnu0'

"

Vcdng"300Co qwpv'qh'creqj qn'equwo gf "kp"ftkhtgpv'uwf kgu"qp"gpf wtcepg"r gthqto cpeg"

Uwf { "	Co qwpv'qh'gyj cpqn'
O eP cwi j vqp"("Rtggeg"*3; ; 8+"	Wpkn'dmqf "creqj qn'ngxgn'tgcej gf "2023." 2027."cpf "203"o i 0 n ³
QdDtlgp"*3; ; 5+"	204."cpf "206"o rñi ^{/3} "DO "
Mgpf tlem'et al."*3; ; 5+"	47"o n"
Ngeqwm'tg"("Uej wv{ "422; +"	ç "52"o n'

"

O cp{ "hcevtu"r n{ "c"tqng"kp"vj g"o gej cpkuo "tgu qpukng"ht"vj g"ko r ckt o gpv"qh"cgtdle" r gthqto cpeg"d{ "creqj qn' Vj gug" kpenwf g"vj g"kpj kdkkqp"qh"i nœeug" qwr w' d{ "vj g"rkxgt" *J gkmqpgp"gv'cn'3; ; : "Mgpf tlen'gv'cn'3; ; 5+ "i nœeug"cpf "nœevg"wr wng"d{ "vj g'y qtnkpi " o wuergu"*Lqthgrf v' ("Lxj rkp/F cphgn'3; 9: + "cpf "i nœegtqn'wr wng"d{ "vj g'rkxgt" *Nwps wku'gv" cn'3; 87+ "y j lej . "kp" wtp. "ngcf u" vq" c" tgf wekqp"kp"i nœeqpgqi gpguku" *Ukgt" gv' cn'3; ; : -0' Creqj qn' j cu" cuq" dggp" uj qy p" vq" j cxg" cp" ko r cev' qp" j { f tcvkqp" ngxgu" qh" r ctvlekr cpw'0' Gi i ngxqp"*3; 64+ "guvko cvgf "vj cv'ht "gxgt{ "qpg'i tco "qh'gvj cpqn'eqpuwo gf "cr r tqzko cvgn' "32" o N'qh'gztc "wtkpg"ku' r tqf wegf 0' Vj ku' o ki j v' chge'vj g'j { f tcvkqp" uvcwu" qh' r ctvlekr cpw' r tkqt" vq" gzer gtko gpv'cn' tkcn'0'

I gpgtcn' tgeqo o gpf cvkqp"ht"i qqf "enklecn' r tceveg" kpenwf g" eqo r ngv" cduvkgpeg"ht qo " creqj qn' eqpuwo r vqp" 46/j qwtu" dghqt g"vj g" gzer gtko gpv'cn' tkcn' *Tcvenkh" gv' cn' 4233+0' kp" ukwcvkqp" y j gtg" creqj qn' kpcng" f qgu" pqv' j cxg" cp{ "kphwpeg" qp" vj g" kpvgtxgpvqp. " cp" co qwpv' rko kgf "vq" vj g"i wkf gkpgu"ht" vj g"i gpgtcn' j gcmj { "r qr wcvkqp" eqwf "dg" cmjy gf "cu" r tgecvkqp" vq" r tngxgpv' vj g" ulf g" ghgeu" qh' j cpi qxgt "kp" ecug" qh' j ki j "creqj qn' eqpuwo r vqp'0' Vj g' tgeqo o gpf gf "f ckn' "creqj qn' kpcng" kp" vj g" WM" ku' pq" o qtg" vj cp" 46/54" i "ht" o gp" cpf " 38/46" i "ht" y qo gp" *Uekpeg" cpf "Vgej pqmji { "Eqo o kwgg. "4233+0' Vcdng" 304" r tguwpv" vj g" o czko wo "tgeqo o gpf gf "co qwpv' qh' f tkpmu"ht" gcej "v{ r g' qh' creqj qn' e" dgxgtci gu'0'

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Vcdrg" 3040' O czko wo " tgeqo o gpf gf " creqj qn' kpcng" r gt" f c{ " hqt" f hgtgpv" v{r gu" qh" dgxgtci gu0'

Crej qle"dgxgtci gu"	O czko wo "tgeqo o gpf gf "kpcng"r gt" f c{ "	
"	O gp"	Y qo gp"
Tgf."Y j kg."cpf "tqug'y kpg" *34' +"	4"ucpf ctf "i rcuugu"qh'397o n'	3"rti g'i rcuu"qh'472o n'
Nqy gt/utgpi yj "rti gt."dggt." cpf "ekf gt" *50' +"	4'r kpu"	30'r kpu"
J ki j gt/utgpi yj "rti gt."dggt." cpf "ekf gt" *704' +"	30'r kpu"	3'r kpv"
Dqwg"qh'rti gt."dggt."cpf " ekf gt" *7' +"	4"dqwg"qh'552o n'	30"dqwg"qh'552o n'
Ecp"qh'rti gt."dggt."cpf "ekf gt" *60' +"	4"ecpu"qh'662o n'	30"ecpu"qh'662o n'
Ukpi rg"uj qv'qh'ur kku" *62' +"	6"uo cm'uj qu"qh'47o n'	5"uo cm'uj qu"qh'47o n'

Uqwtg<Uekpeg"cpf "Vgej pqm { "Eqo o kgg."4233"

"

1.2.6 Vitamins and minerals

I gpgtcm{."tgugetej gtu" f q"pqv"ucpf ctf kug"xkco kp"cpf "o kpgtci"kpvcngu"qt"uetggp"uwdlgeu" vq"kf gpvkh{ "f ghekgpeku"vj cv'o ki j v'chge"vj g"tguwu"qh"vj g"uwf { 0Vj ku"ku"eqpukf gtgf "vq"dg" vko g"eqpuwo kpi "cpf "cf f "gzvc"equv"ht"pq"uki pkecpv"cf f kkpnci'dgpgkh"vq"vj g"uwf { 0Nqpi " vgo "uwf kgu"kp"r ctkewrct"uj qwf "r c{ "enugt"cwgpvkp"vq"egt vkp" f ghekgpeku"uwej "cu"ktqp0' Kqp" f ghekgpe { "ku"j ki j n{ "r tgcrgpv"lp" hgo crg"cy rgvu"cpf "j gcnj { "y qo gp" *F k"Ucpvqm"gv" cr0'4229="Quqlk" ("Cj o gvxle"422: "O gwrgt" ("\ ko o gto cpp"4232+0'Vj g"tcvg"qh"ktqp" f ghekgpe { "co qpi uv" hgo crg"cy rgvu"ku"ctqwpf "4: ' " *F k"Ucpvqm"gv"cr0'4229="O gwrgt" (" \ ko o gto cpp"4232+."y j kg"vj g"tcvg"qh"ktqp" f ghekgpe { "cpcgo kc"ku": 08' " *j cgo qi mqdkp">" 342"i 0N³="hgttkkp">"34"Ui 0N³="F k"Ucpvqm"gv"cr0'4229+0'Vj g"r tgcrgpeg"ku"gxgp"j ki j gt"lp" cf qnuegpv" hgo crg"cy rgvu"tgej kpi '74' " *Ucpf ut³o "gv"cr0'4234+0'Kqp" f ghekgpe { "cpcgo kc" y cu"uj qy p"vq"tgf weg"qz { i gp"tcpur qt v"lp"vj g"dqf { "vq"y qtnkpi "o wuengu"y j lej "f getgcugu" XQ_{40 cz} " cpf " gpf wtcepeg" r gthqto cpeg" *F gmcXcng" 4235+0' Vj g" r tqdrgo " qeewtu" y j gp" r ctvkr cpw"uactv"vj g"uwf { "y kj "uwdqr vko cni'rgxgu"cpf "vj gp"tgwtp"vq"pqto cni'f vtkpi "vj g"

uwf { "kp" ecug" yj g{ "uactv" kqp" uwr r ngo gpvcvkp0' Vj g" uwr r ngo gpvcvkp" y kni' rfcf "vq" cp"
 ko r tqxgf "XQ_{40 cz}"cpf "gpf wtcepg"r gthqto cpeg" *Hkfg o cpp"gv'cr0'4223="O ci c| cpkn'gv'cr0'
 3; ; 3="O eEnpi "gv'cr0'422; +0'K r tqxgo gpw"kp"XQ_{40 cz}"ecp"tgcej "90' "kp"qp0' "5"y ggmu"
 *O ci c| cpkn'gv'cr0'3; ; 3+0'Rctvkr cpw'y j q"ctg"npqy p"vq"dg"f ghkcpv"cpf "ctg"wpf gtvcnkp" c"
 vgcwo gpv'uj qwf "dg"gzewf gf "htqo "uwf lgu" *lgceqeng"("Dwtng"4232+0'

"

1.2.7 Antioxidants

Cpvkz kf cpw"uwej "cu'nwglp."n{eqr gpg."ugrpkwo ."xkco kpu"C."E."cpf "G"ctg"uwdwcepgu"yj cv"
 r n{ "cp"ko r qtvcpv"tqrg"kp"pgwtcrkupi "htgg"tcf kcnu"kp"yj g"dqf {0'Htgg"tcf kcnu."uwej "cu"
 tgcevkxg"qz {i gp"ur gekgu."ctg"wpwcdng"o qrgewgu"npqy p"vq"ecwug"qz kf cvkqp"rgcf kpi "vq"egm"
 f co ci g" *Ukpf j k' gv' cr0' 4235+0' Vj gtg" ku" pqto cm{ "c" dncpeg" dgw ggp" yj g" ngxgn' qh"
 cpvkz kf cpw"cpf "htgg"tcf kcnu"kp"yj g"dqf {0'Cp"ko dncpeg"y qwf "ecwug"qz kf cvkxg"ut guu"
 eqpvtkdwkpi "vq" yj g" f gxgnr o gpv' qh' cewg" cpf "ej tqple" f kugcugu" uwej "cu" ecepgt" cpf "
 cvj gtquergtquku" *F cmg/F qppg" gv' cr0' 4228+0' K' j cu" dggp" uj qy p" yj cv' utgpwqwu" gz gtekug"
 kpetgcugu"yj g"tgngcug"qh"htgg"tcf kcnu"ecwukpi "f co ci g"cpf "kphco o cvkqp"vq"o wueng"kuuwgu"
 *F gmgtu"gv'cr0'3; ; 8+0'K"eqpvtcuw."c"o qf gtcvg"gzr quwtg"qh'ungngvno' wuengu"vq"htgg"tcf kcnu"
 cu" c" eqpugs wpepg" qh" nqy "vq" o qf gtcvg" kpvpukv{ "gz gtekug" ecp" kpf weg" r j {ukmqi kcn'
 cf cr cvkqp"d { "kpetgcukpi "yj gk"qz kf cvkxg"r qvgpvkn" *Rnc {gt"("Ngy ku"4234+0'Vj ku"lpenwf gu"
 i tgcvgt"cpvkz kf cpv' gp| {o g"cevkxk{ "cpf "gpj cpepf "r tqgcevkxg"ko o wpg"tgur qpugu" *Uknk w"
 Nco kpc"4235+0'Xkco kp"E"uwr r ngo gpvcvkp"kp"j ki j "f qugu"ecp"r tgxgpv'yj gug"cf cr cvkpu"vq"
 vclpkpi "j gpeg" f getgcukpi "vclpkpi "ghkcpv{ " *I qo gl /Ecdtgtc" gv' cr0' 422; +0' I qo gl /
 Ecdtgtc"et al."f go qpwtcvgf "yj cv'yj g"kp" gukqp"qh'3"i "qh'xkco kp"E"r gt"fc { "qxgt" c"vclpkpi "
 r gkqf "qh": "y ggmu" f getgcugf "yj g"gzr tguukqp"qh"o clp"vcpuetkr vkp" hcevqu" yj cv' r n{ u"cp"
 ko r qtvcpv"tqrg"kp"o kqej qpf tkcn'dkqi gpguku'0'Vj gtghqg. "yj g"equwo r vkp"qh"cpvkz kf cpw"
 f wtkpi "npi "vgo "uwf lgu"kp"ctgcu"uwej "cu"tgeqxt { "cpf "vclpkpi "cf cr cvkqp"ecp"kpvtgtg"
 y kj "yj g"pcwtcn' r tqegu" qh" yj g"kpvtxgpvkp0' Vj wu" k' ku" guugpvkn' vq" cxqkf "cpvkz kf cpv"
 uwr r ngo gpvcvkp" f wtkpi "uwej "kpvtxgpvkpu0"

Cpvkz kf cpw"ctg"pqv'wuwcm{ "ucpf ctf kugf "f wtkpi "tgugcte"j "uwf lgu'0'Vj g"ucpf ctf kucvkp"qh"
 cpvkz kf cpv'kpcng"uj qwf "dg"cnng"kp"vq"eqpukf gtcvkp"kp"ukwcvkpu"y j gtg"kv"j cu" c" f kgev"
 ko r cev" qp" yj g" kpvtxgpvkp0' Hqt" gzco r ng. "c" uwf { "gzco kpkpi " yj g" ghgev" qh" vclpkpi "
 r tqi tco o gu" qp" r j {ukmqi kcn' ej cpi g" qxgt" c" npi " r gkqf 0' Kpwtwevkpu" vq" cxqkf "

uwr r ngo gpvcvkqp"uj qwf "dg"i kxgp"v"r ctvlekr cpw"r tkqt "v"j gk"r ctvlekr cvkqp"kp"j g"uwf { "
*lgceqeng"("Dwtng"4232+0'

"

1.2.8 Supplements

K' wngu"j qwtu"v"fc{u"ht"flgvt{"uwr r ngo gpw"v"gpj cpeg"r j {ulecn"r gthqto cpeg"cpf "
r j {ukqmi le"tgur qpug"*Mlgf gt"gv'cr0'4232+0'Hqt"gzco r ng."j g"equwo r vkqp"qh'dlectdpcvg"
j qwtu"dghqtg"gztekug"ecp"ko r tqxg"cpctgdle"r gthqto cpeg"*Npf j "gv'cr0'422: + "y j gtgcu."
etgcvkpg"cpf "dgv/cncpkpg"uwr r ngo gpvcvkpu"vng"fc{u'dghqtg"ukl pklcgv"ko r tqxgo gpw"ctg"
qdugt xgf "F wengt"gv'cr0'4235="J qy g"gv'cr0'4235="Nkf ng"("Eqppqt"4235+0'Etgcvkpg"
uwr r ngo gpvcvkqp"j cu'dggp"uj qy p"v"lpetgcug"o wueng"etgcvkpg"ngxgnu"*J cttku"gv'cr0'3; ; 4+ "
ngcf kpi "v"gpj cpegf "ur tkvki "r gthqto cpeg"*Rtggp"gv'cr0'4223="Ks wgtf q"gv'cr0'4224+ "
lpetgcugf "utgpi j "F go r ug{ "gv'cr0'4224+ "cpf "j ki j "lpvgpuk{ "r qy gt"qwr w"*Mlgf gt"4225+0'
K'ku"gcukgt"v"eqpvtqn"uwr r ngo gpw"uwej "cu'dlectdpcvg"fwtkpi "j g"tkcn"r tgr ctvlekr"r gtkf "
cu"j g{"pqto cm{"j cxg"cu"j qtvgtgto "ghgev"kuvki "ngui"j cp"46"j qwtu"eqo r ctgf "v"qj gt "
v"r g"qh"uwr r ngo gpw0'Hqt"gzco r ng."k'wngu"6/8"y ggmi"ht"o wueng"etgcvkpg"v"tgwtp"v"
tgukpi "ngxgnu"qpeg"ucwtcvkqp"ku'tgcej gf "*Rtggp"gv'cr0'4225+0'Vj gtghqtg."gxgp"kh'uwdlgeu"
uqr "etgcvkpg"uwr r ngo gpvcvkqp"dghqtg"j g"uctv"qh"j g"uwf { ".k'o ki j v'ukm'cngt"j g'tguwu"qh"
cpctgdle"r gthqto cpeg"dgw ggp"vy q"tkcn"eqo r ngvf "ngui"j cp"hw"y ggmi"cr ctv0' C "
y cuj qw"r gtkf "dgw ggp"tkcn"ku"guugpvkn"ht"o clpn{ "vy q"tgcuqpu<qhgt"uwdlgeu"ko g"v"
tgeqxt"htqo "j g"rtgxkwu"gztekug"vuv"cpf "i kxg"vko g"ht"j g"lpvtxgpvkqp"ghgev"v"
f ko kpkuj "*J qr nkpu"gv'cr0'3; ; ; +0"

"

Cm' uwr r ngo gpw"vngp" d{ "r ctvlekr cpw"uj qwf "cny c{u"dg"tgeqtf gf 0' Vj qug" npqy p"v"
lpvgtcev"y kj "j g"uwdwpcpeg"dgkpi "uwf kgf "qt"j g"lpvtxgpvkqp"uj qwf "dg"cxqkf gf "cpf "kp"
uqo g"ecugu"vko g"ht"y kj ftcy cn"uj qwf "dg"rtqxkf gf "*Tcverkh"gv'cr0'4233+0'K'k'ku"ctgcf {"
npqy p"j cv"j g"uwr r ngo gpvcvkqp"fqgu"pqv"j cxg"cp{"ghgev"qp"j g"lpvtxgpvkqp."j gp"
r ctvlekr cpw"y km'dg"cmqy gf "v"eqpvkpwg"j g"equwo r vkqp"qh"j g"j cdkwcn"lpvng="j qy gxgt."
k'ku'tgeqo o gpf gf "j cv"j g{"nggr "c'tgeqtf "qh"j gk"equwo r vkqp"*lgceqeng"("Dwtng"4232+0'

"

"

1.3 Approaches to dietary standardisation

1.3.1 Dietary assessment

O cp{ "fkgvct{ "cuuguuo gpv'vej pls wgu"j cxg"dgpp"fgxgmqr gf "qxtg"vj g" { gctu"vq"ko r tqxg"vj g" ceewtce{ "qh" fkgvct{ "kpcng" o gcuwtgo gpv' Vj gtg" ctg" ewttgpvn{ "y q" v{r gu" qh" fkgvct{ "cuuguuo gpv" cr r tqcej gu' Vj g" hktuv" wugu" c" tgvqtur gevxxg" o gvj qf "y j kej "o gcuwtgu" fkgvct{ "kpcng"vj cv'j cu'dggp'tgegpvn{ "equpuwo gf 0'Vj ku'v{r g" kpenmf gu'vej pls wgu'uwej "cu'F_{tgecm}" hqqf "htgs wpe{ "s wgu'kppcktg." cpf " fkgv" j kxqt{ 0' Vj g" ugeqpf " v{r g" qh" cuuguuo gpv" wugu" c" r tqur gevxxg" o gvj qf "y j kej "o gcuwtgu" qpi qkpi "fkgvct{ "kpcng 0'Vj ku' kpenmf gu" y gki j gf "cpf " guko cvgf "H_{geqtf}" cpf "vj g" f wr rdecvg" r qt vqp" o gvj qf "O ci nqu" ("l cppcnqwk" 4225+0'F kgvct{ "tgecm" cpf "H_{geqtf}" "guko cvgf "cpf "y gki j gf "ctg" ewttgpvn{ "vj g" o ckp" vy q" fkgvct{ "cuuguuo gpv" vej pls wgu" wugf "kp" t'gugctej "uwf lgu" cu'ckf "vqnu" vq" j gr "uwlgeu" tgr rdecvg" vj gk "fkgv" "kq0'vq" ucpf ctf kug" fkgvct{ "kpcng=Lgceqeng" ("Dwtng" 4232+0'Hqt" gzco r rg. "uwlgeu" ctg" kput wevgf "vq" tgeqtf "cm" hqqf "cpf "f tkpmi" equpuwo gf "vj g" f c{ "dghqtg" Vtkn'30'Vj gp" vj g{ "ctg" i kxgp" c" eqr { "qh" vj g" H_{geqtf}" cpf "kput wevgf "vq" tgr rdecvg" k' r tkqt "vq" Vtkn'40'C" pqvg" qh" ecwkqp" ku" f wg" j gtg" ukpeg" vj g" xcrlf k{ "qh" vj g" o gvj qf "ecp" j cxg" cp" ko r cev' qp" vj g" fkgv' tgeqtf gf "qp" vj g" hktuv" qeecukqp 0' Cp" wpf gt guko cvkp" qh" hqqf "kpcng" qp" vj g" hktuv" qeecukqp" o gcpu" vj cv' gxgp" kh" r ct vkr cpw" tgr rdecvg" gzcevn{ "vj g" tgeqtf gf "fkgv" vj gtg" y kn'dg" c" f kuetgr cpe{ "kp" vj g" co qwpv" qh" hqqf "equpuwo gf "dgy ggp" dqvj "qeecukqp 0'Vj gtghqtg. "k' ku" guugpvkn' vq" ej qqug" c" o gvj qf "vj cv' j cu" c" nqy "rgxgn' qh" o kutgr qt vki "y j gp" t{ kpi "vq" ucpf ctf kug" fkgvct{ "kpcng" kp" t'gugctej " uwf lgu 0"

Gctn{ "uwf lgu" j cxg" vkgf "vq" gzco kpg" vj g" xcrlf k{ "qh" F_{tgecm}" cpf "H_{geqtf} 0'Vj g" o ckp" hko kcvkp" qh" vj gug" o gvj qf u'y cu" vj g" o kutgr qt vki "o ckpn{ "wpgt/tgr qt vki + "qh" fkgvct{ "kpcng" gur gekm{ "kp" qxgty gki j v' cpf " qdgug" r gqr ng" *J kn' ("F cxkgu" 4223+0' O kutgr qt vki "ku" o gcuwtgf "d{ " eqo r ctkpi "vj g" tgr qt vgf "gpgti { "kpcng" y kj "vj g" gpgti { "gxr gpf kwtg" o gcuwtgf "wulpi "f qwdn{ " rcdgmfg" y cvgt "vej pls wg" *f g" Lapi g" gv' cr' 0' 4229=Vtcdwnik' ("Uej qgmgt" 4223+0' Dt lghn{ "k' eqpuku" qh" vj g" equpuwo r vqp" qh" f qwdn{ "rcdgmfg" y cvgt "vj cv' eqpvckpu" vy q" ucdrg" kuqvr gu" f gwgtkwo " *4J + "cpf " qz { i gp/3: " *3: Q+0' Vj g" gko kpcvqp" tcvg" qh" vj gug" kuqvr gu" ku" vj gp" o gcuwtgf "d{ " eqmgevki "wtkpg" uco r ngu" *cngtpcvkxgn{ "ucrkxc" qt "dmqf "ecp" dg" wugf + "qxgt" vko g 0'Vj g" eqmgevki r gtlkf "xctlgu" dgy ggp" 9" cpf "43" f c{ u" *f g" Lapi g" gv' cr' 0' 4229=Vtcdwnik' ("Uej qgmgt" 4223+0' Vj g" vej pls wg" r tqxf gu" cp" cxgtci g" qh" gpgti { "gxr gpf kwtg" qh" ugxgtcn' f c{ u" cpf "ecppqv" dg" wugf "vq" o gcuwtg" o kutgr qt vki "qh" c" ukpi ng" f c{ 0'Vj g" ceewtce{ "qh" vj ku"

o gjv qf " ku" j ki j n{ " f gr gpf gpv" qp" vj g" cuuwo r vkqp" vj cv" kpf kxkf wcnu" ctg" y gli j vucdng" vj tqwi j qwv'vj g'uwf { "Uej qgmg"3; ; 2+0"

Vj g"I qrf dgti "ew/qhh"ku"cpqvj gt "o gjv qf "wugf "y j gp"vq"o gcuwtg"o kutgr qtvpki "kp" c"rti g" r qr wcvkqp" cpf " vq" j gnr " kf gpvh{ " o ku/tgr qtvtu0 Vj ku" o gjv qf " eqpuku" qh" f kxkf kpi " vj g" o gcuwtgf "gpgti { "kpvcng"vulpi "c" f lgvct { "cuuguuo gpv'vej pls wg"d { "vj g"dcucn'o gvcdrke"tcvg" gkj gt "o gcuwtgf "vulpi "kpf kgev'ecrqtlo gt { "qt" guko cvgf "vulpi "cp"gs wcvkqp" *GKDO T+0Vj g" xcnwg" qdvckpgf "ku"eqo r ctgf "vq"cp" guko cvgf "r j { ulecn'cevkkv{ "rgxgn" *RCN="Drcem'4222=" I qrf dgti . "Drcem'gv'cr03; ; 3+0Vj g"cuuwo r vkqp"o cf g"ku'vj cv'vj g"GKDO T"ku"gs wcn'vq"RCN0 Kk' vj g" xcnwg" qdvckpgf " ku" dgmjy " vj g" ew/qhh" *Kq0 RCN+ " o gcpu" vj cv' vj g" kpf kxkf wcn' ku" o kutgr qtvpki " vj gk" gpgti { " kpvcng0 I qrf dgti " ew/qhh" ku" c" i qqf " vqqn' hqt" f gvevqp" qh" o kutgr qtvpki " cv" c" i tqwr " rgxgn' dw' pqv' cv' vj g" kpf kxkf wcn' rgxgn0 Vj g" o gjv qf " j cu" r qqt" ugpukxkv{ "cpf" qpn{ "f kunkpi vkuj gu"rti g" f gi tggv"qh"o kutgr qtvpki " *Drcem'4222+0C" o clqt" rko kcvkqp"qh" I qrf dgti "ew/qhh"ku"vj cv'vj g"RCN"ej qugp"o c { "pqv'tgr tgugpv'vj g"tgcn'RCN"qh" vj g"r qr wcvkqp"dglpi "uwf kgf 0I qrf dgti "et al."*3; ; 3+"ktuv'uwi i guvgf "vj g"wug"qh"RCN"gs wcn' vq"30/7="j qy gxgt. "pqv'cm'uwdi tqwr u"qh"vj g"r qr wcvkqp"j cxg"vj g"uco g" rgxgn'qh'cevkkv{ 0 Vj gtghgtg. "k' j cu" dggp" tgeqo o gpf gf " vj cv' RCN" uj qwr " dg" o gcuwtgf " gur gekcm{ " kh" vj g" uco r ng'uk' g"ku"dgmjy "322" *Drcem'4222+0Kk' uco r ng'uk' g"ku'cdqyg"322. "vj gp" uwdlgeu"uj qwr " dg"kpustwvvgf "vq" hkn'c"r j { ulecn'cevkkv{ "s wguvkppcktg"kp"qtf gt "vq"dg"emukkkgf "kp"vq" f khtg gpv" i tqwr u"qh"RCN0

C"eqpukf gtcdng"co qwpv'qh"rkgtcwtg"j cu"dggp"r wdrkuj gf "qp"vj g"xckf kv{ "qh'dqvj "H_{geqtf} "cpf " F_{tgecm} "vej pls wgu"kp" vj g" i gpgtcn' r qr wcvkqp0 Tgugctej gtutgr qtvgf "c" f khtgpeg"dgw ggp" gpgti { " kpvcng" cpf " gpgti { " gnr gpf kwtg" kp" vj g" i gpgtcn' r qr wcvkqp" *pqto cn' y gli j v. " qxgty gli j v. "cpf "qdug" kpf kxkf wcnu"tcpi kpi "dgw ggp"/6 "cpf "/5; ' " *Rtgpveg"gv'cr03; ; 8=" Nlxkpi uvpgg"gv'cr03; ; 2="I qrf dgti "gv'cr03; ; 5="I qrf dgti . "Rtgpveg. "gv'cr03; ; 3="P gnuqp"gv' cr03; ; ; =Drcem'gv'cr03; ; 7+0Vj g"cxgtci g"rgxgn'qh'wpf gtguko cvkqp"ku'dgrkxgf "vq"dg"ctqwpf " 42' " *O gt vj "gv'cr03; ; 3="Nlxkpi uvpgg"gv'cr03; ; 2+0Vj g"gpgti { "kpvcng"o gcuwtgf "kp"vj gug" uwf kgu"y cu"o clpn{ "eqo r ctgf "vq"gpgti { " gnr gpf kwtg" f gtxgf "vulpi "f qwdn{ "ncdgmjy "y cvgt" cpcn{ uku" f wtkpi "9" vq"57" f c { u0J qy gxgt. "qpg" rko kcvkqp"ku"vj cv'cu"vj g" f wcvkqp"qh" f cvc" eqmgvqp" kpetgcugu. " vj g" ceewtce { " qh" f lgvct { " cuuguuo gpv" f getgcugu" *I gtuqkv{ " gv' cr0 3; 9: +0Hqt "gzco r ng. "grkg"e { erkuv'eqo r gvki "qp"vj g"Vqwt" f g"Hicpeg"wpf gt/tgeqtf gf "vj gk" gpgti { "kpvcng" d { "38' " vj g"ktuv" y ggm'cpf " d { "57' " cv" y ggm' vj tgg"qh" vj g"eqo r gvkkqp"

*Y gungtvgr "gv'cr0'3; : 8+0'Rqqt"eqo r nkpeg"vy ctf u"vj g"gp f "qh" c"m p i "vgto "uwf { "o ki j v" j cxg"cp"ko r cev"qp"vj g"cxgtci g"gpgti { "kpcng."j gpeg'tgf weg'ceewtce{0"

O kpg"et al."*3; ; 3+"cnuq"tgxgcngf "vj cv'uwdlgeu"uki pkhecpw{ "wpf gt/tgr qtvgf "gpgti { "kpcng" qp"vj g"ugeqpf "y ggm'qh"cuuguu gpv'eqo r ctf "v"vj g"htuv"chgt "qdugt xpi "c"tgf wekqp"kp" gpgti { "kpcng"y j kg"gpgti { "g zr gp f kwtg"cpf "dqf { "o cuu"uc { gf "vj g"uco g0'O kpg"et al." uwi i gungf "vj cv'uwdlgeu"o ki j v'dgeqo g"vktgf "qh"nggr kpi "c"y gli j gf "H_{geqtf} "hqt"vy q"y ggm" y j lej "ecwugu"wpf gt/tgr qt vpi 0'Qp"vj g"qvj gt"j cpf."y j gp"fkpvcpu"cuukngf "c y ngvu"kp" y gli j kpi "cm'hqf "eqpuwo gf "qxgt"7"f c{u."Ul³/₄ k"et al."*3; ; 6+"tgr qtvgf "c" f kuetgr cpe{ " dgw ggp"gpgti { "kpcng"cpf "g zr gp f kwtg"qh'2' 0Cm'vj gug"kp kpi u"uwi i guv'vj cv'vj g'pwo dgt" qh'f c{u"tgeqtf kpi "qxgtguwo cv"vj g"wpf gt/tgr qt vpi "d{ "tgugtej "uwdlgeu0'Vj gtghgtg."vj g" o ku/tgr qtvgf "rgxgu"qdugt xgf "kp"uwf kgu"wkpi "o wnk r g/f c{u"fkgt { "cuuguu gpw"o c{ "pqv" dg"tgr tgugpvcxg"qh'vj g"xckf k{ "qh"qpg"f c{ "cuuguu gpw0'Qp"vj g"qvj gt"j cpf."y j gp"uwf kgu" wug" c'uj qtvgf "eqmgevkp"r gkqf "v"cxqf "vj g" f getgcug"kp"kpvgu'qh'r ct vkr cpw'kp'tgeqtf kpi " hqf "kpcng."tgugtej gtu" hceg" c" pgy "r tqdrgo 0'Ucy c{c" et al."*3; ; 8+"kpxguki cvgf "vj g" ci tggo gpv'dgw ggp"gpgti { "g zr gp f kwtg"wkpi "f qwn{ "rdgngf "y cvgt"cpf "gpgti { "kpcng"qp" vy q"qecukpu"wkpi "46/j qwt"F_{tgecm}0'I qqf "ci tggo gpv'y cu"qdugt xgf "dgw ggp"qvcr'gpgti { " g zr gp f kwtg"*; 0 4"O l"r gt" f c{ "+"cpf "f kgt { "kpcng"qdvkpgf "htqo "vj g"htuv"F_{tgecm}"*; 0/8"O l" r gt" f c{ +0' k" eqpvcuv." qp" vj g" ugeqpf " qecukp." f kgt { " kpcng" *9069" O l" r gt" f c{ "+" uki pkhecpw{ "f khtgf "htqo "vj g"htuv"qecukp"cpf "qvcr'gpgti { "g zr gp f kwtg0'Vj ku"ku" f wg"vq" vj g" f c{ /vq/f c{ "xctk vqp"qh"gpgti { "kpcng"y j lej "ku"45' " *P gnuqp"gv'cr0'3; ; : =Dkpi j co " 3; : 9+0'

Vj g'nti g"xctk vqp"kp"wpf gtguwo cvkp"qh'hqf "kpcng"eqwf "dg"cwtkdwgf "v" f khtgpegu"kp" r j { uken'cpf "r u{ej qm i kcn'ej ctcevgtku'qh'r ct vkr cpw'uwej "cu"dqf { "o cuu'lpf gz " *DO K." cf kr qukv{." f kgt { "tgutckp" *Drem'gv'cr0'3; ; 7=Nch{ "gv'cr0'3; ; 9+"cpf "uqek/geqpqo le" ucwu" *Lqj puqp"gv'cr0'3; ; : +0'Hqt"gzco r rg."DO Kj cu"dggp"uj qy p"v"dg"j ki j n{ "eqttgrv" y kj "wpf gt/tgr qt vpi " *Mtgvej "gv'cr0'3; ; : =Vqo q{ cuw'gv'cr0'3; ; : +0'Mtgvej "cpf "eqmgi wgu" tgr qtvgf "vj cv'wpf gt/tgr qt vpi "kp"qdug"y qo gp"y cu" f qwdrg"vj cv'qh'pqto cn'y gli j v'y qo gp" *42' "cpf "32' ".tgur gevkg n{ +0'kf kxf wcu"y kj "kpetgcugf "cf kr qukv{ "ctg"cnq"o qtg"knkn{ "v" wpf gt/tgr qt vj cp"vj gk"rgcpgt "eqwpvtr ctw" *J gko cpp"3; ; 5=Nch{ "gv'cr0'3; ; 9=Lqj puqp"gv' cr0'3; ; : +0'Vy q"o ckp"hevqtu"eqpvdw"v"vj g"wpf gtguwo cvkp"qh'f kgt { "kpcng<3+"wpf gt/" tgeqtf kpi "qt" otgr qt vpi " *f grkdgtcv"qt" uwdeqpuekwu" cpf "4+"wpf gt/gc vpi " *ugg"ugevkp" 3040+0' Vj g"htuv"hevqt" kpenf gu"o kutgr qt vpi "s wcpvkgu" cpf "f guetkr vqp"qh'hqf "kgo u"

eqpuwo gf "Dwtng"4223d+0'O qtgqxtg."uqo g"uwlgevu"kpceewtcvgn{ "tgr qtv"lqqf "kgo u"vj cv' ctg"uwuwm{ "r gteglxgf "cu"wpj gcnj { "O gtv "3; ; 4=Uej qgngt "3; ; 2+0'C "ncm'qh'o qvxcvqp" eqwrf "cnuq"rgcf "v"o kutgr qtvpi "gur gekm{ "y j gp"uwlgevu"ctg"cong "v"nggr "c" H_{geqtf} "qxgt" ugxgtcnf c{ "u"qt"y ggm0Wpf gt/gcvpi ."qp"vj g"qvj gt"j cpf ."o ki j v'qeewt "f wg"v"vj g"lpetgcugf " dwtf gp"qp"r ctvlekr cpw"y j gp"vj g{ "ctg"cong "v"nggr "c" H_{geqtf} "O kpg"gv'cn0'3; ; 3+0'Vj gk" dgj cxkwt"o ki j v'dg"cngtgf "d{ "cxqf kpi "o qtg"eqo r rgz "lqqf "vj cv'ctg"f khlkew"v"tgeqtf " *J km{ ("F cxkgu"4224=Uej w{ "gv'cn0'3; ; 4+0'Hqt"kpucpeg."vj ku"o ki j v'rgcf "v"y gki j v'quu" y j lej " y cu" qdugt xgf " kp" o cp{ " npi " vgo " uwf lgu" kpxguki cvpi " f lgvct { " cuuguu gpw" *Uqemg{ "3; ; 7=O kpg"gv'cn0'3; ; 3+0'Uqo g"r ctvlekr cpw"o ki j v'gxgp"lqpf "k'cp"qr r qtwpk{ " hqt"flgvpi *J km{ ("F cxkgu"4223+0'

P qvlegcdn{ " dgwgt" ci tggo gpw" dgwy ggp" gpgti { " kpcng" cpf " gzer gpf kwtg" *2" vq" 35' " f khtgpeg+y gtg"qdugt xgf "k'vtclpgf "cvj ngvu"eqo r ctgf "v"vj g'i gpgtcnr qr wcvqp" *Lqpgu{ (" Ngkej "3; ; 5=Y guvgtvtr "gv'cn0'3; ; 8=Uej w{ "gv'cn0'3; ; 4=U $\frac{3}{4}$ k'p"gv'cn0'3; ; 6=F cxkgu"gv'cn0' 3; ; 9+0'J qy gxgt."c"pwo dgt"qh'uwf lgu"y gtg"cdng"v"lqpf "uki plklecpv'f kuetgr cpekgu"dgwy ggp" gpgti { " kpcng"tgr qtvf "cpf " gpgti { " gzer gpf kwtg"o gcwtgf "kp"uqo g"i tqwr u"qh" cvj ngvu." o clpn{ "hgo cngu" *Vtcr r g"gv'cn0'3; ; 9=Gf y ctf u"gv'cn0'3; ; 5=J km{ ("F cxkgu"4224+0'Ugxgtcn' hcevqtu"o ki j v'j cxg"eqptkdwgf "v"vj ku"r qqt"ci tggo gpw0'Hgo cng" cvj ngvu"uwuwm{ "tgr qtv" mpy gt" gpgti { " kpcng" *Dglf rgo cp"gv'cn0'3; ; 7=Gf y ctf u"gv'cn0'3; ; 5=Uej w{ "gv'cn0'3; ; 4+" gur gekm{ "vj qug"cnkpi "r ctvlp"y gki j v'eqpuekwu"ur qt w'uwej "cu"i { o pcukcu" *Hqi grj qm "gv' cn0' 4229+" cpf " y j qo " j cxg" r tqdrgo u" y kj " vj gk" dqf { " ko ci g" *Dwtng" 4223d+0' F lgvct { " cuuguu gpw"eqpf wvfg "f wtkpi "r gtlqf u"qh"lpetgcugf "vtclpki "xqnwo g"ecp"lpetgcug"wpf gt/ tgr qtvpi "cu"y gmi *Xcp"Gwgp"gv'cn0'3; ; 9+0'k'cf f kkp."c"tgxky "r wdrkuj gf "k'4225"tgxgcngf " vj cv'cu" gpgti { " gzer gpf kwtg"lpetgcugu."wpf gt/tgr qtvpi "lpetgcugu"kp" cvj ngvu" *O ci nqu{ (" [cppenqwk"4225+0'K"o ki j v'dg"vj cv'cvj ngvu"y kj "j ki j " gpgti { " kpcng"lqpf "k'f khlkew"v" tgo go dgt"qt"v"tgeqtf "cm'o gcu."upcemu."cpf "f tlpnu"eqpuwo gf "qxgt" c"46/j qwt"r gtlqf "qt" npi gt "Dwtng"4223c+0'Qxgtcm'O ci nqu"cpf "[cppenqwk" *4225+"eqpenwf gf "vj cv'vj gtg"y cu" c"wtqpi "r qukkxg"eqttgrvqp"t"? "0 65."p">"0223+"dgwy ggp" gpgti { " kpcng"cpf " gzer gpf kwtg"kp" cvj ngvu0' Vj g" gxkf ppeg"ltqo "cm" vj gug"uwl lgu" qp" cvj ngle"cpf "pqp/cvj ngle" r qr wcvqpu" uwi i guu"vj cv'vtclpgf "o cng"cvj ngvu"ecp"tgeqtf ltgecm'f lgvct { " kpcng"y kj "c"eqpukf gtcdng" r tgeklqp0""

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1.3.2 Replicating usual diet

ƁƁ" y gŋ/eqpvŋqŋgŋf " etquuxgt " f guki p " uwwf kgu. " r ctvƁkr cpw " ctg " cunŋf " vq " eqpuwo g " vj gkt " j cdkwcnf f kŋvct { " Ɓvcnŋ " r tkqt " vq " vj g " hktuv " vƁcn " cpf " vj gp " vq " tgr nƁcvŋ " vj g " uco g " f kŋv " r tkqt " vq " gxgt { " uwdugs wŋpv " vƁcn " f kŋv " tgr nƁcvŋ " ku " wugf " vq " r tŋxgpv " xctkcdkŋv { " Ɓ " f kŋvct { " Ɓvcnŋ " y j lej " ecp " cf f " pŋkug " vq " vj g " tguwŋu " qh " c " uwwf { " *lgceqeng " (" Dwtŋg " 4232-0Tgugctej gtu " o c { " wug " f tgecm " cpf " Hgeqtf " *guvko cvŋf " qt " y gki j gf + " vŋej pls wŋu " cu " cp " cŋf " vqŋn " vq " j gr " uwdlgeu " tgr nƁcvŋ " vj gkt " f kŋv " f gcm { . " tguŋctej gtu " uŋ qwŋf " wug " vj g " i qŋf " ucpf ctf " -ucpf ctf kugf " f kŋv " y j lej " eqpukw " qh " r tqxkf Ɓpi " r tg/r cenŋi gf " o gcn " vq " r ctvƁkr cpw " o "

"

1.3.2.1 Standardised diet

Tgugctej gtu " r tqxkf g " uwdlgeu " y kŋj " cm " vj gkt " hqŋf " tgs vktgo gpw " Ɓ " cf xcpŋg " qh " vŋvƁpi " *wŋwcn { " 3 " vq " 5 " f c { u-0Vj g " r tg/r cenŋi gf " o gcn " i kŋgp " r tkqt " vq " gŋej " vƁcn " ctg " kŋf gpvƁcn " Ɓ " vj gkt " gpŋti { " cpf " o cetqpwtkŋpv " eqpvŋpw " cpf " Ɓf kŋf wcnkugf " vq " o gŋv " r ctvƁkr cpw " f cŋ { " tgs vktgo gpw " *Twj gthŋtf " gŋv " cn " 04232-0Vj g " r tg/r cenŋi gf " o gcn " r tqxkf gf " uŋ qwŋf " cnuŋ " ceeqwpv " hŋt " hŋqŋf " r tŋhŋtgpegu " 0J qy gxgt. " Ɓ " uŋo g " ecugu. " o gcn " ecp " dg " f hŋgtgpv " Ɓ " eqpvŋpw " y j gp " vj g " Ɓvŋtxgpvŋŋp " eqpukw " qh " f kŋvct { " o cŋkr wcnvŋŋp " *O qpeŋf c / lko gpŋŋ " gŋv " cn " 0422; -0 " Hŋt " Ɓvŋxŋŋg. " uŋo g " uwwf kgu " r tqxkf g " c " ucpf ctf kugf " o gcn " j qwtu " dgŋŋtg " vj g " gŋr gtŋo gpv " 0K " ku " r tqxkf gf " gkŋj gt " cu " ucpf ctf " dtgcnhŋv " qt " upcenŋ " *Dggrŋp " gŋv " cn " 0422; -0 "

Qpŋ " qh " vj g " nŋ { " cf xcpŋi gu " qh " ucpf ctf kugf " f kŋv " *Uf kŋv " vŋej pls wŋ " ku " ku " j ki j " eqo r nƁŋŋg " tcvŋ. " y j lej " tŋf wegu " vj g " xctkcdkŋv { " Ɓ " gpŋti { " cpf " o cetqpwtkŋpv " Ɓvcnŋ " *lgceqeng " (" Dwtŋg " 4232-0Vj g " dgwŋt " vj g " tgr gcvdkŋv { " qh " vj g " vŋej pls wŋ. " vj g " uo cnŋgt " vj g " co qwpv " qh " pŋkug " Ɓ " vj g " tguwŋu " *lgceqeng " (" Dwtŋg " 4232-0Vj ku " vŋej pls wŋ " cnuŋ " o cnŋu " kŋ " ku " gcukgt " vq " ej gŋm " eqo r nƁŋŋg " qp " vj g " uco g " f c { 0Tgugctej gtu " eqwŋf " gkŋj gt " wug " c " ej gŋm " ku " qt " y gki j " vj g " nŋhŋxgtu " vq " ecŋwŋŋŋ " vj g " cewcn " co qwpv " qh " hŋqŋf " eqpuwo gf 0Vj g " r tg/r cenŋi gf " o gcn " ecp " dg " r tgr ctgf " vq " uwwf " Ɓf kŋf wcn " pŋŋf u " cpf " tgs vktgu " pŋ " ghŋŋtv " hŋqo " uwdlgeu " 0Vj g " hŋgg " r tg / r cenŋi gf " o gcn " r tqxkf gf " f wtkŋi " vj g " uwwf { " o ki j vŋwŋcev " uŋo g " r ctvƁkr cpw " vq " vcnŋ " r ctv " o "

Equv " cpf " vko g " qh " r tgr ctvŋŋp " ctg " vj g " vŋ q " o cŋŋ " f kŋf xcpŋi gu " qh " Uf kŋv " 0Vj g " equv " ecp " xct { " uki pŋhŋŋŋŋŋ { " f gr gpŋf Ɓpi " qp " vj g " vŋ r g " cpf " s wŋpvŋv { " qh " hŋqŋf " r tqxkf gf 0Vj ku " o gŋj qŋf " ku " vko g " eqpuwo Ɓpi " cu " y gŋm " Tgugctej gtu " pŋŋf " vq " ur gpŋf " vko g " vq " dw { " vj g " hŋqŋf " kŋgo u. " ew " cpf " y gki j " cm " hŋqŋf u " Ɓ " ur gŋkŋŋ " r qt vŋŋp " ukŋ gu. " cpf " r cenŋi vj go " Ɓ " dqz gu " cpf " r ŋwŋŋ " dci u " 0Gŋr gt vŋŋ " ku "

cnuq"tgs wktgf "lp"qtf gt "v"o gcuwtg"vj g"fgvct { "tgs wktgo gpv"qh"gej "uwlgev"cpf "vj gp"r rcp"c" fkgv"vj cv"o ggu"vj gk"pggf u0Vj g"vej pls wg"o ki j v"vqngtcvg"rkwr"hgzkdkrkv { "lp"o gcnr rcpkpi " gur gekm { "lp"ecug"uwlgev"uwlhtg"htqo "cmgti { "qt"kpqngtcpeg"v"cp { "qh"vj g"hqf "kgo u" r txxkf gf 0 Vj gug"uwlgev" o ki j v"pggf "v" dg" gzenf gf "htqo " vj g" uwf { "j gpeg" mqukpi " r ctvkr cpw0Vj g"fgv"o ki j v"dg"uki pkkcpv { "f khtgvp"vj cp"vj g"j cdkwcn"fgv"qh"uwlgev" y j lej "ecp"etgcv"fgv" hqt0Rctvkr cpw"y kn"cnuq"pggf "v"o cmg"gztc"xkuku"v"eqngev"vj g" r tgr centi gf "o gcu"lpetgculpi "vj g"dwtf gp"qp"vj go 0 Kp"uqo g"ecugu."r ctvkr cpw"o ki j v" eqpuwo g"cf f kkpncn"hqf = "vj gthgtg."r ctvkr cpw"uj qwf "dg"kpwtwvfg "v"tgeqtf "qp"c"lqf " fkt { "uj ggv"cp { "f gxcvqp"htqo "vj g"fgv0Vj ku"o gvj qf "o wuv"dg"wgf "y j gp"fgv"j cu"i tgc v kphwpeg"qp"vj g"kpwtgvpkqp"qt"r gthgt cpeg0O qtgxgt."y j gp"vj g"gzr gevfg "ghgev"ku" uo cm"cpf "cp"gpj cpegf "tgrcdk { "ku"tgs wktgf 0K"ku"cnuq"wgf "y j gp"vj g"tgs wktgf "tguwtegu" ctg"cxkcdng"uwej "cu"hwf kpi ." vko g." unkmf "tgugtej gtu."cpf "hqf "r tgr ctvqp"ctgc" *Igeqeng" ("Dwtng"4232+0)

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1.3.2.2 Food record

Rctvkr cpw"ctg"cumf "v"tgeqtf "cm"hqf u"cpf "hkf u"eqpuwo gf "qpg"v"vj tgg"fc { "u'dghgtg"vj g" htu"gzr gtlo gpvntkcn"lp"c"lqf "fkt { 0Rctvkr cpw"ctg"kpwtwvfg "v"dtkpi "vj g"lqf "fkt { " qp"fc { "3"y j gtg"kv"y kn'dg"ej gengf "s wcrkcvkgn { "d { "tgugtej gtuhqt"o kuupi "qt"lpeqo r ngv" fcv0Vj gp"vj g { "y kn'dg"kpwtwvfg "v"tgr rccvg"vj g"fgv"r tkqt "v"gxgt { "uwdugs wgpv"tkr0"

Kpwtwvqp"qp"j qy "v"eqo r ngv"c"lqf "fkt { "ctg"pqto cm { "i kxp"v"r ctvkr cpw"v" ko r txxg"cewtce { 0C"uco r ng"lqf "fkt { "eqwf "dg"i kxp"v"i wfg"r ctvkr cpw"qp"vj g" co qwpv"qh"fgvku"vj g { "uj qwf "dg"lpenf kpi 0 Vj g"lqf "fkt { "ku"fkf gf "lpv"ugxgtcn" ugvkpu0Rctvkr cpw"j cxg"v"tgeqtf "vj g"vko g"cpf "r meg"y j gtg"lqf u"cpf "f tkpm"y gtg" eqpuwo gf 0F gcvku"cdqw"vj g"dtcpf "pco g."eqnkpi "cpf "r tgr ctvqp"o gvj qf u"uj qwf "cnu"dg" lpenf gf 0 Hkpcn { "r qtvp"uk g"qt"swcpv { "gcvp"uj qwf "dg"tgeqtf gf "lp"fgvku"vupi " j qwgj qrf "o gcuwtg"*g0 0ur qppu."ewr u."cpf "dqy nu."lp"y gki j v"*g0 0tgeqtf gf "qp"rcengf " lqf "kgo u+."cpf "lp"fk gupkpu"*Drcm"4223+0C"lqf "cvru"ecp"dg"wgf "v"ko r txxg"vj g" cewtce { "qh"vj g"guko cvkp0C"lqf "cvru"ku"c"uo cm"dqmqv"vj cv"eqpvkpu"r kwtgu"qh" f khtgvp"r qtvp"uk gu"qh" f khtgvp" lqf "kgo u" *Cvnpup"gv" cr0 4224+0 J qy gxgt." kpwtfwkpi "c"lqf "cvru"y kn"lpetgcug"vj g"eqv"qh"vj g"uwf { "eqv"qh"dqmqv+cpf "ku"rko kgf " lp"vj g"pwo dgt"qh"lqf "kgo u"lpenf gf "g0 095"lqf "kgo u"lp"Cvnpup"et al."4224+0"

Vj g"y gki j gf "H_{geqtf} "ku"cuq" wugf "kp"tgugctej "cpf "ku" c"o qtg"ceewtcvg" vgej pls wg" vj cp" vj g" guko cvgf "H_{geqtf} "f guetldgf "gctrktg" Rctvlekr cpw" ctg" cungf "vq" y gki j "cpf "tgeqtf "cm" hqqf "eqpuwo gf "wukpi "c" uecng. "y j kng" hmwf "kpvcng" wukpi "o gcuwtkpi "ewr u0Rctvlekr cpw" ctg" cungf "vq" y gki j v" cpf "tgeqtf "vj g" nghqxgtu" cu" y gm" *O ci nqu" ("[cppenqwk" 4225+0' Rj qvqi tcr j le" H_{geqtf} "j cu" dggp" tgegpw{ "kptqf wegf "vq" ko r tqxg" vj g" ceewtce{ "qh" vj g" tcf kkpccn" H_{geqtf} "o gvj qf "dcugf "qp" r gp" cpf "r cr gt" *Uo cm' gv' cr0' 422; +0' Rctvlekr cpw" ctg" r tqxkf gf "y kj "c" eco gtc" cpf "c" hqqf "f kct{ 0' Vj g{ "ctg" cungf "vq" tgeqtf "cpf "vcng" c" r lewtg" qh" cm' hqqf u" cpf "f tlpnu" eqpuwo gf 0' Vj ku" o gvj qf "j gr u" ko r tqxg" f cv" cpcn{ uku' d{ "r tqxkf kpi "tgugctej gtu" y kj "o qtg" kphqto cvkqp" cdqww" vj g" r qt vqp" uk' g" eqpuwo gf 0' J qy gxgt. "vj ku" vgej pls wg" c f f u" gz t c" dwtf gp" qp" uwdlgeu" 0' Rlewtgu" uj qwf "dg" ecr wtgf "htqo "c" egtvlekr "f kncpeg" cpf "cpi ng" htqo " vj g" hqqf "kgo "qt" r rvg0' k" c f f kkp. "c" uo cm' twgf "vcdng" emj vj "qt" twgt "pggf u" vq" dg" wugf "hqt" ueckpi "r wtr qugu" 0' Vj g" wug" qh" r j qvqi tcr j le" tgeqtf "o ki j v" chgevg" vj g" gcvkpi "dgj cxkwt" qh" uwdlgeu" cpf "tgf weg" eqo r rncpeg" y j gp" ugxgtcn' f c{ u" qh" H_{geqtf} "ctg" tgs wkt gf " *Uo cm' gv' cr0' 422; +0'

kp" uqo g" ecugu. "f kgv" j cu" pq" qt" nqy "ko r cev" qp" vj g" qweqo gu" qh" c" uwf { 0' Eqpugs wgpw{ . " r ctvlekr cpw" ctg" cungf "vq" nnggr "c" H_{geqtf} "46/j qwt" dghqtg" gcej "tkcn'y kj qwtgr rlecckpi "k0' Vj g" f kctkgu" ctg" vj gp" cpcn{ ugf "cv" vj g" gpf "qh" vj g" uwf { "cpf "wugf "vq" gzt r klp" cp{ "wpgzr gevfg" " tguwmu" *Uej wo o "gv' cr0' 422; +0' Vj ku" r tceveg" o c{ "ngcf "vq" rcti g" xctkcvkpu" kp" f kgvt { "kpvcng. " j gpeg" j ki j gt "tkm' qh' pqkug" kp" vj g" tguwmu" 0'

Vj g" hqqf "tgeqtf "vgej pls wg" ku" eqpukf gtgf "nguu" gzt r gpukxg" vj cp" vj g" U_{fkgv} "cpf "cmqy u" uwdlgeu" vq" hmqy "vj gkt" j cdkwcn" kpvcng0' k" c f f kkp. "wprkng" vj g" 46/j qwt "F_{tgecm} "vgej pls wg. "k" tgrkgu" nguu" qp" o go qt { "tgf wekpi "vj g" pwo dgt" qh" hqti qwgp" hqqf " *Vj qo r uqp" ("D{ gtu" 3; ; 6= Drcem' 4223= Igceqeng" ("Dwtng" 4232= O ci nqu" ("[cppenqwk" 4225+0' J qy gxgt. "hqqf "tgeqtf u" o c{ "pqv' cny c{ u" tghgevg" vj g" r ctvlekr cpw" uwwcn' f kgvt { "kpvcng0' Vj g" cy ctgpguu" qh' tgeqtf kpi " hqqf "kpvcng" o ki j v' cngt" vj gkt" gcvkpi "dgj cxkwt0' k" c f f kkp. "uwf lgu" j cxg" f guetldgf "nqy " eqo r rncpeg" tcvg" y j gp" vj g" fwtcvkqp" qh" vj g" H_{geqtf} "gzeggf u" vj tgg" f c{ u0' Rquukdng" wpf gtguko cvkqp" eqwf "tguwmu" y j gp" uwdlgeu" hqti gv" vq" tgeqtf "hqqf "eqpuwo gf "qt" f wg" vq" vj g" f kthkewm{ "kp" guko cvkpi "r qt vqp" uk' gu0' Vj ku" o gvj qf "j gcxkn{ "tgrkgu" qp" j qpguv{ 0' Hqqf "uggp" cu" wpij gcmj { 0' o c{ "pqv' dg" tgeqtf gf 0' Rquukdng" xctkcdkxk{ "eqwf "cuq" tguwmu" y j gp" uwdlgeu" ctg" cungf "vq" tgr rlecvg" vj gkt" hqqf "f kct{ 0' Hkpcn{ . "vj g" o gvj qf "ku" vko g" eqpuwo kpi "f wg" vq" vj g" pggf " qh' cpcn{ ukpi "cm" vj g" f kctkgu" *Vj qo r uqp" ("D{ gtu" 3; ; 6= Drcem' 4223= Igceqeng" ("Dwtng" 4232= O ci nqu" ("[cppenqwk" 4225+0' k" uwo o ct { . "vj g" hqqf "tgeqtf "vgej pls wg" uj qwf "dg"

wugf "y j gp"3+"nti g"ghgevl"ku"gzr gevgf . "4+"y j g"fgv"j cu"ny "lo r cev"qp"y j g"lpvgtxgvpkqp. "5+"
dqy "ko g"cpf "hwpf kpi "ctg"tgutkevgf . "cpf "6+"y j g"eqpuwo r kqp"qh'r tg/r centi gf "fkgv"ku"pqv"
r quukdg"fgv"q"y j g"nemi"qh'uqtc i g'hcekklku0

"

1.3.2.3 Dietary recall

C"46/j qwt"F_{tgecm}"lpvgtxky "ku"eqo r ngvgf "qp"y j g"htuv"fc { "qh"vgukpi 0Rctvlekr cpw"ctg"cong f "
vq"rkuv"cm"hqf "cpf "f tkpm"eqpuwo gf "qxtg"y j g"r cuv"46"j qwtu0'S wugkqpu"cong f "f wtkpi "y j g"
lpvgtxky "kpenw g" ko g. "co qwpv"cpf "f guetkr kqp"qh"hqf "qt" f tkpm"eqpuwo gf . "cpf "y j g"
r tgugpeg"qh"cp { "nghqxtu0Rctvlekr cpw"ctg"y j gp"i kxgp"ceqr { "qh"y j g"fgv"q"tgr rkecvg"kv'r tktq"
vq"gxgt { "uwdugs wgpv"tkrf0"

Vj g"o wnr ng/r cuu"o gy qf "hqt"46/j qwt"F_{tgecm}"j cu"dggp"fgxgnr gf "d { "y j g"WU0F gr ctwo gpv"
qh"Ci tlewnwtg"*WUCF +"vq"lo r tqxg"y j g"ceewtce { "qh"y j g"tcf kkpncn"F_{tgecm}"f guetkdgf "gctrkt0"
Vj g"o wnr ng/r cuu"o gy qf "eqpuku"qh"7"uvr u<"

3+"Eqo r ngvg"cs wem"ku"qh"hqf "eqpuwo gf "wukpi "y j g"r ctvlekr cpw"qy p"tgecm"utcvgi lgu0"

4+"Tgo kpf "y j g"r ctvlekr cpw"qh"htq qwgp"hqf "dcugf "qp"pkpg"ecvgi qtkgu"qh"hqf 0"

5+"Ej tqpqmi kcm { "f kur m { "y j g"ko g"cpf "pco g"qh"y j g"qecukqpu0"

6+"Cumcdqw"y j g"fgckl"qh"y j g"hqf "eqpuwo gf "kpenw kpi "f guetkr kqp"cpf "co qwpv0"

7+"Eqo r ngvg"chpcn'r tqdg"vq"tgecm"hqf "y cv"y j g"uwdlgev"o c { "dg"eqpukf gtgf "pqv"y qtvj "
o gpvqpkpi 0"

Vj g"clo "qh"y j ku"o gy qf "ku"vq"o kpk kug"y j g"co qwpv"qh"htq qwgp"hqf "cpf "vq"ucpf ctf kug"y j g"
s wugkqpu"cong f "f wtkpi "y j g"lpvgtxky "dgvy ggp"cpf "y kj kp"uwdlgeu"*O quj hgi j "gv'cr0422: +0"
Ugxgtcn"uwf lgu"j cxg"o gcuwtgf "o kutgr qt vki "wukpi "y j g"o wnr ng/r cuu"o gy qf "cpf "hwpf "
y j cv"y j g"fhgtgpeg"dgvy ggp"gpgti { "gzr gpf kwtg"cpf "kpcng"y cu"dgvy ggp"3"cpf "36" "
*Eqpy c { "gv'cr04226=Two r ngt"gv'cr0422: =O quj hgi j "gv'cr0422: =Uwdct"4225=Vqq| g"gv'cr0'
4226-0' Vj gtg"y cu"qpq"eqo o qp"hevt"dgvy ggp"uwf lgu"y j q"tgr qtvgf "j ki j "ngxgnu"qh"
f fhgtgpeg"y j lej "ku"DO K'Cu"o gpvqpgf "gctrkt."DO K'j cu"dggp"uj qy p"vq"dg"j ki j n"
eqttgrcvgf "y kj "wpgt/tgr qt vki "Mtguej "gv'cr03; ; ; =Vqo q { cuw'gv'cr03; ; ; +cpf "y j cv"y cu"
cnuq"fgo qpwtcvgf "kp"uwf lgu"wukpi "y j g"o wnr ng/r cuu"o gy qf "Uwdct"4225=Vqq| g"gv'cr0'

4226+0'Kp"eqpvtcu."kpf kxkf wcn"y kj "pqto cn'dqf { "o cuu"wpf gtguko cvgf "f kgvt { "kpcng"d { " qpn{ "5' "3' "k"o gp"cpf "8' "k"y qo gp+0"

Uko knt"vq"H_{geqtf}"*ugg"ugevkqp"305040+."y j gp"f kgv"j cu"pq"qt"muy "ko r cev'qp"vj g"qweqo gu."c" 46/j qwt"F_{tgecm}"o ki j v'dg"eqpf wevgf "vq"cuuguu"hqf "kpcng"dghqtg"gej "tkcn"y kj qw"cp { " tgr rdecvkqp"*Dqpf "gv'cn0'4234+0'Vj g"tgecmu"ctg"vj gp"cpn{ugf "cv"vj g"gp"qh"vj g"uwf { "vq" gZR rkp"cp { "wpgZR gev"tguwu0'Vj ku"r tceveg"ngcf u"vq"rti g"xctkcvkpu"kp"f kgvt { "kpcng" j gpeg"j ki j gt"tkm'qh'pqkug"kp"vj g"tguwu0"

Vj g"f kgvt { "tgecm"vej pls wg"ku"kpZR gpukxg"cpf "cmuy u r ctvlekr cpw"vq"hmuy "vj gk"uwcn" f kgv"y kj qw"chgevkpi "k"O ci nqu" ("[cppenmwkc"4225+0J qy gxgt."vj ku"vej pls wg"tgs wktgu" ur gekn'gZR gtvkug"vq"eqpf wev"vj g"kpvtxkgy u"cpf "vj gp"cpn{ug"cm"vj g"fcv0'hw"vj gto qtg."k" tgrku"qp"r ctvlekr cpw"o go qt { "vq"tgo go dgt"y j cv"y cu"eqpuwo gf "qp"vj g"fc { "dghqtg"cpf " vj gk"j qpgu"cu"y gm0'Rctvlekr cpw"o ki j v'hpf "k"fhlewn"vq"tgr rdecv"vj g"f kgv'dghqtg"gej " tkcn"wukpi "vj g"F_{tgecm}"uj gg0'Vj ku"o ki j v'ngcf "vq"xctkcdkx{ "kp"gpgti { "cpf "o cetqpwtkpv" kpcngu0' Kp"cf f kxqp."r ctvlekr cpw"j cxg" c" vpgf gpe { "vq"wpf gtguko cvg" F_{tgecm} f wtkpi "vj g" kpvtxkgy "*Vj qo r uqp" ("D { gtu"3; ; 6="Drcem"4223="lgceqeng" ("Dwtng"4232="O ci nqu" ("[cppenmwkc"4225+0Kp"uwo o ct { "vj ku"o gvj qf "ku"wugf "y j gp"3+rti g"ghgevk"ku"ZR gev" .4+ " vj g"f kgv"j cu"muy "ko r cev'qp"vj g"kpvtxgpvkqp."5+dqvj "ko g"cpf "hwpf kpi "ctg'tgutkvgf."cpf "6+ " vj g"eqpuwo r vkqp"qh'r tg/r centi gf "f kgv'ku"pqv'r quukdrg"vq"vj g"rcem'qh'uqtc i g'hcekkxku0 "

1.3.2.4 Dietary prescription

Vj g"f kgvt { "rtguetkr vkqp"vej pls wg"ku"uwcn{ "wugf "y j gp"tgugtej gtu"ctg"vti gvkpi "qpg"qt" o qtg"ur gekh"pwtkpv"vj g"fc { u"rtgegf kpi "vj g"tkcn"*lgceqeng" ("Dwtng"4232+0'Vj gtg"ctg" f khtgtpv'uegpctku"y j gtg"vj ku"o gvj qf "ecp"dg"cr r rkgf "vq0'ht"gzco r rg."c"rkuv'qh'hqf "tlej "kp" ectdqj { ftcv"ku"i kxgp"vq"j gr "r ctvlekr cpw"tgej "c"ur gekh"vti gv'qh'ectdqj { ftcv"kpvcng0' Vj g"rkuv'eqpvkpu"r qtvkqp"uk gu"qh'hqf "kgo u"cpf "vj gk"ectdqj { ftcv"eqpvgp0'Rctvlekr cpw" ctg"kpwtwevgf "vq"nggr "c"hqf "f kct { "uq"tgugtej gtu"ecp"ej gen'ht"eqo r rkcpeg0'Kp"eqpvtcu." vj g"f kgvt { "rtguetkr vkqp"o gvj qf "ecp"dg"wugf "vq"j gr "uwdlgew"cxqkf "qpg"qt"o qtg"pwtkpv" npqy p"vq"kpvtgtg"y kj "vj g"kpvtxgpvkqp"*lgceqeng" ("Dwtng"4232+0'Vj wu."r ctvlekr cpw"ctg" i kxgp"c"rkuv'qh'hqf u"vq"cxqkf "*g0'0c"rkuv'qh'hqf "vj cv'eqpvkpu"echhkgp-g0"

Vj g"vej pls wg"j cu"my "equ"cpf "j gr u"tgugtej gtu"vq"eqpvtqn"ur gekhe"lqqf lpwtlcpv"lp"vj g" f kgv"Rctvlekr cpw"ctg"cdrg"vq"eqpuwo g"lqqf u"vj g{"wuxcm{"gcv"cpf"y km"i kg"vj go "vj g" hgzkdkrk{"qh"ej qqulpi "ltqo "vj g"rkuv"qh"lqqf u"*Lgceqeng"("Dwtng"4232+0Vtclpki "qp"j qy " vq"r rcp"vj g"f kgv"cpf "wug"vj g"rkuv"ku"pggf gf "cpf "gZR gt vug"y km'dg"pggf gf "vq"cpn{ ug"vj g"lqqf " f kctkgu"lqt"eqo r rkepeg0Vj g"vej pls wg"ecp"ngcf "vq"j ki j "xctkdkrk{"lp"vj g"v{r g"cpf"co qwpv" qh"gej "lqqf "eqpuwo gf "r tkqt"vq"gxgt {"v{kn"f wg"vq"f khtgpegu"lp"lqqf "ej qlgu"cpf "ecp"cf f " cf f kqpcn"equ"vq"r ctvlekr cpw"vq"dw{"egtckp"lqqf "kgo u"rkvgf "qp"vj g"rkuv" *Lgceqeng"(" Dwtng"4232+0"Kp"uwo o ct {" "vj ku"vej pls wg"ku"wugf "y j gp"3+"rti g"ghgev"ku"gzr gevdf ."4+" Rctvlekr cpw"ctg'y kmki "vq"r w'gztc"ghqtv"vq"r rcp"vj gkt"f kgv."5+"vj g"eqpuwo r vkp"qh"ur gekhe" i tqwr "qh"lqqf "qt"ur gekhe"co qwpv"ku'tgs vktgf ."cpf "6+"vj g"eqpuwo r vkp"qh"r tg/r cenci gf "f kgv" ku"pqvr quukdrf"wg"vq"vj g"rcem"qh"uvqtc i g"hekkkgu0

1.4 Summary

Vj ku" ej cr vgt" dgi cp" d {" j ki j rki j vki " vj g" tqrg" qh" f kgvct {" eqo r qpwpv" cu" gzvcpqgwu" xctkdrgu0K"tgxky gf "vj g"lhwgpeg"qh"ugrgevdf "r ctco gvgtu"*tgrxcpv"lp"o cp {"ur qt v"cpf " gzgtekg"tgugtej "+"qp"ng {"qweqo gu"*g0'gzgtekg"r gthqto cpeg."XQ4o cz."TRG+."vj gug" eqo r qpwpv"ecp"j cxg"uki pklcpv"ko r cev"qp"r j {ulecn"r gthqto cpeg."r j {ukmqi lecn"cpf " dlqmqi lecn" r ctco gvgtu0 Vj g" qpn {" y c {" vq" eqpvtqn" vj go " ku" gkj gt" d {" grko lpcvki " qt" eqpvtqnki "vj gkt"lpcng"f vtkpi "vj g"rtg/v{kn"r tgr ctcvkp"r gtkqf 0'F kgvct {"ucpf ctf kucvkp" o gvj qf u" y gtg" tgxky gf 0' Vj gkt" cf xcpvci gu" cpf " f kucf xcpvci gu" y gtg" f kuewugf 0' Hwtvj gto qtg."vj g"ukwcvkpu"y j gtg"vj g {"uj qwr "dg"wugf "y gtg"r tqr qugf 0'F gur kg"gzvgpukxg" tgugtej "qp"vj g"xcrkf k{"qh"vj gug"o gvj qf u."vj gkt"tgr tqf wekdkrk{"tgo ckpu"wpegtckp0

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1.5. Aims of this PhD

Vj ku" vj guku" ku" eqpegtpgf " y kj " vj g" tgr tqf wekdkrk\ " qh" c" f kgv" wulpi " f khtgtpv" f kgvct { " ucpf ctf kucvkqp" cr r tqcej gu" cpf " r ctvlekr cpwø" cdkrk\ " vq" hmqy " kputwekqu0" Vj g" eqpugs wpegu"qh"r qqt"eqo r rkepeg"vq"vj g" f kgv" f wtkpi "vj g" r tg/vtkn"r tgr ctcvkqp"r gtlkf "qp" gz gtekug"r gthqto cpeg. "pwtkgpv"qz kf cvkqp. "cpf "dmqf "dkqo ctngtu"y gtg"cuq"lpxguki cvg 0'

Ej cr vgt "4" cko gf "vq" kf gpvh\ " vj g" f kgvct { " ucpf ctf kucvkqp" cr r tqcej gu" ewtgpv\ " wugf " d { " tgugetej gtu" vq" eqptqn" f kgvct { " kpcng" r tg/gzr gtko gpvni" vtknu0' K' gzco kpgf " cm" tngxcpv" uwf lgu"r wdrkj gf "k" vj g" Lqwtpci"qh"vj g" kpgtpcvkqpci"Uqelgv\ "qh"Ur qtu" P wtkkqp" cpf "vj g" kpgtpcvkqpci" Lqwtpci"qh"Ur qtu" P wtkkqp" cpf "Gz gtekug" O gvedqkuo "Itqo "422: "wpvni"42360"

Ej cr vgt "5" cko gf "vq" cuugu" vj g" tgr tqf wekdkrk\ " qh" c" f kgv" y j gp" f kgvct { " tgecm" hqqf " tgeqtf " cpf "ucpf ctf kugf " f kgv" y gtg" wugf "cu" f kgvct { " ucpf ctf kucvkqp" vgej pls wgu0"

Vj g" cko "qh" vj ku" hwtvj "ej cr vgt" y cu" vq" cuugu" vj g" cdkrk\ "qh" c" vj ngvu" vq" tgr rkecv" c" f kgv" y j gp" rks wkf "cpf "uqrf " r tg/r cenci gf " f kgv" y gtg" wugf "cu" f kgvct { " ucpf ctf kucvkqp" vgej pls wgu0' Vj g" rks wkf " r tg/r cenci gf " f kgv" y cu" r tguqvgf "cu" cp" cngtpcvkxg" cr r tqcej "vq" vj g" vcf kkpenci" uqrf " r tg/r cenci gf " f kgv0'

Ej cr vgt "7" cko gf "vq" lpxguki cvg" vq" y j cv" gz wgvf" gr gpf gpv" xctkcdngu" *100' gpf wtcepg" ecr cekv\ " cpf "r j { ukqni keni" tgr qpugu" +ctg" chgevgf " d { " o cplk wcvkpi "46/j qwt" ectdqj { ftcvg" kpcng" y kj kp" vj g" v\ r keni" tci g" qh" xctkcvkqp" *37' +qdugtxgf "kp" qwt" gctrlgt" hpf lpi u0'

Ej cr vgt "8" cko gf "vq" o gcuwtg" vj g" lpekf gpeg" qh" r ctvlekr cpw" y j q" y gtg" j { r qj { ftcvgf "qp" vj gkt" cttkxci" vq" vj g" mdqtcvqt { " chgt" tgegkxkpi " gpeqwtci go gpv" vq" uvc { " y gmj { ftcvgf 0'

Hlpcmi\ "Ej cr vgt "9" cko gf "vq" lpxguki cvg" vj g" ghgevg" qh" cewg" gz gtekug" *y cmkpi "cpf "e { enkpi + r tkqt" vq" I K' vguvpi " qp" vj g" y kj kp/ uwdlgev" xctkcdkrk\ " qh" dmqf " i nweqg" cpf " kpuwkp" tgr qpugu0"

Vj g" qxgtcm" cko " qh" vj ku" Rj F " y cu" vq" gzr cpf " qwt" npqy ngf i g" qh" vj g" ewtgpv" f kgvct { " ucpf ctf kucvkqp" vgej pls wgu" wugf " y kj "go r j cuku" qp" vj g" lo r qtvcepg" qh" lo r ngo gpvpi " j ki j gt" s wcrk\ " f kgvct { " ucpf ctf kucvkqp" cr r tqcej gu0' Cp" gpj cpegf " o gvj qf "vq" eqptqn" f kgvct { " kpcng" f wtkpi "vj g" r tg/vtkn" r tgr ctcvkqp" r gtlkf "ku" cuq" r tqr qugf 0' "

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Chapter 2

A profile of dietary standardisation techniques used in sport science research

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2.1 Summary

Vj gtg" ku" ewttgpn{ " c" neni' qh' r wdrkuj gf " rkgtcwtg" qp" vj g" ko r qtcpeg" qh' f kgvct { " ucpf ctf kucvkqp"cpf "vj g's wcrk{ "qh'f kgvct { "ucpf ctf kucvkqp"cr r tqcej gu'ewttgpn{ "dgp{ "wugf 0' Vj gtghqtg."vj g"clo "qh'vj ku'tgxkgy "y cu"vq"kf gpvh{ "vj g"f kgvct { "ucpf ctf kucvkqp"cr r tqcej gu' ewttgpn{ "wugf "d{ "tgugctej gtu"vq"eqptqn'f kgvct { "kpcng"dghtg"gzr gtlo gpvni'tknu0'Vj ku' tgxkgy "gzco kpgf "cm'gzr gtlo gpvni'uwf lgu"r wdrkuj gf "kp"kp"vj g" kpgtpcvkqpcn' Lqwtpcn' qh' Ur qtV' P wtkkqp" cpf "Gzgtekg" O gxcdqkuo " *KUP GO "+"cpf "vj g" kpgtpcvkqpcn' Uqekgv{ "qh' Ur qtV' P wtkkqp" *LKUP "+"cpf "KUP GO ."qxgt "vj g"ruv"9" { gctu" *422: /4236+0' Vj g" kpenwkqp" etkgtk{ "y gtg" f gvto kpgf "d{ "vj tgg'tgugctej gtu"cpf "y gtg"3+"vj g"gzr gtlo gpvni'tqveqn'o wuv dg"cewg"ruvki "ngu"vj cp"46/j qwtu."4+"vj g"uwf { "j cu"vq"dg"qp"j wo cp"uwlgeu."cpf "5+"vj g" uwf { "uj qwf "eqpvkpu"cv'ngcu"vy q"gzr gtlo gpvni'tknu0' T guwu"uj qy gf "vj cv'89" "qh'uwf lgu" r wdrkuj gf "kp"KUP GO "cpf "65' "kp"LKUP "ucpf ctf kugf "f kgvct { "kpcng"dghtg"tknu0' Hqkf " tgeqtf "y gli j gf "cpf "guko cvgf "+"y cu'tgugctej gtu"r tghgtgf "o gvj qf "hqt"eqptqnkpi "f kgvct { " kpcng"cpf "y cu"uwf "kp"6; ' "cpf "kp"3: ' "qh'vj g"uwf lgu"r wdrkuj gf "kp"KUP GO "cpf "LKUP ." tgur gevkg{ "0'Rt/r centi gf "o gcu" *ucpf ctf kugf "f kgv"y gtg"r tqxkf gf "d{ "qpn{ "hgy "uwf lgu" *8' "kp"KUP GO "cpf ": ' "kp"LKUP +0'Crr tqzko cvgn{ "67' "qh'uwf lgu" hckgf "vq"ucpf ctf kugf "f kgvct { "kpcng"r tkqt "vq"gzr gtlo gpvni'tknu"qt "f kf "pqv'o gpvkp" k0Tgugctej gtu"o c{ "gpj cpeg" vj g"cewtce{ "qh'vj gkt "uwf lgu"kh'vj g{ "r c{ "emugt"cvgpvkp"vq" f kgvct { "ucpf ctf kucvkqp"cpf "wug" j ki j gt"s wcrk{ "cr r tqcej gu"uwej "cu"ucpf ctf kugf "f kgv"cpf "y gli j gf "H_{geqtf} "vej pls wgu"vq" tgf weg"vj g"xctkcdk{ "kp" f kgvct { "kpcng"dgvy ggp"tknu0'

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2.2 Introduction

F kgvct { " ucpf ctf kucvkqp" kp" tgugctej " uwf lgu" clo " vq" o kpo kug" vj g" ghgev" qh' f kgvct { " eqo r qpgpu"uwej "cu"echkgp"qp"uwf { "qweqo gu0'Uqo g"uwf lgu"wug"o kpo cni'cr r tqcej gu" y j lej "kpxqkxg"cumkpi "uwlgeu"vq" hqmqy "vj gk"uwcn'f kgv"cpf "vj gp"o qpkqt "vj gk" hqkf "kpcng" vj g" f c{ "dghtg" gcej "tkni" *Qwrcy "gv"cr0'4235="Tqdgwu"gv"cr0'4234+0' Ukeg"vj gtg"ku"pq" eqptqn'qxgt "hqkf "cpf "hmkf "eqpuwo gf ."gpgti { "cpf "o cetqpwtkpv" kpcngu"y kn'o qtg"rkng{ " xct { " dgvy ggp" tkni" *Dkpi j co " 3; : 9=" P gnuqp" gv"cr0' 3; : ; +0' O qtg" eqptqmgf " tgugctej " r tqveqn'tgeqtf "f kgvct { "kpcng"vj g" f c{ "dghtg"vj g" hku'v' tkni'cpf "vj gp" kphqto "r ctvek cpw"vq" tgr ncev"vj g"tgeqtf gf "f kgv"r tkqt "vq"gxgt { "uwdugs wgpv' tkni" *Dnqo gt "gv"cr0'4232="Ukigrt "gv" cr0'4235+0' O gvj qf u'uwej "cu" F_{tecm} "y gli j gf "H_{geqtf} . "cpf "guko cvgf "H_{geqtf} "ctg"uwcm{ "wugf "vq"

ecr wtg"y j g"co qwpv"cpf "v{r g"qh"lqqf "eqpuwo gf "qp"y j g"htuv"qeecukqp0Vj gug"o gj qf u"ctg" f ghkpgf" kp" ugevkkp" 3004" cnpi " y kj " f gvckgf " f guetkr vkp" qh" y j gk" cf xcpwi gu" cpf " f kucf xcpwi gu0"

Vj gtg" ku" ewttgpwn{ " c" rcmi" qh" r wdrkuj gf " rkgtcwtg" qp" y j g" ko r qtwcpeg" qh" f kgvct { " ucpf ctf kucvkp"cpf "ku"ghgeev"qp"r j { ulecn'r gthqto cpeg"cpf "r j { ukqmi lecn'tgur qpugu0Vq" qwt"npqy rgi g"lgy "tgxky u"cpf "gzr gtlo gpvcn'uwf lgu"j cxg"eqxgtgf "y ku"vqr le"J qr nkpu"gv" cr03; ; ; =Igcceqeng"("Dwtng"4232=Y cnj "gv'cn04228=Ngp| "gv'cn04225+0Vj gtghqtg."y j gtg"ku" c"pggf "vq"eqpf wev" c" uwtxg{ "kp" qtf gt "vq" r tqxkf g" cp" kf gc" cdqww" y j g" s wcrkv{ "qh" f kgvct { " ucpf ctf kucvkp"cr r tqcej gu"ewttgpwn{ "wugf "kp"tgugctej "uwf lgu0"

C"uo cm'uwtxg{ "y cu"eqpf wevgf "cpf "o gpvkpgf "kp" c"tgxky "r wdrkuj gf "d{ "Igcceqeng"cpf " Dwtng"*4232+0Vj g"uwtxg{ "gzco kpgf "cm'uwf lgu"r wdrkuj gf "kp"y j g"Kvgtpcvkpcn'Lqwtpcn'qh" Ur qtv'P wtkkqp"cpf "Gzgtekg"O gwcdqkuo "KUP GO "+"tqo "4226"vq"422; 0Vj g{ "tgr qtvgf " y j cv" y j g" o quv" cf cr vgf " f kgvct { " ucpf ctf kucvkp" vgej pls wg" y cu" H_{geqtf}." hqmy gf " d{ " y j g" r tqxkukqp" qh" ucpf ctf kugf "r tg/r cenci g" o gcn0Vj g"uwtxg{ "cnq"uj qy gf "y j cv" qp g"kp"ulz" uwf lgu'hckgf "vq"ko r ngo gpv'cp{ "f kgvct { "ucpf ctf kucvkp"cr r tqcej "y j g"fc{ u'dghqtg"r j { ulecn' r gthqto cpeg'tkcn0J qy gxgt."k'y cu'rko kgt "d{ "y j g"pwo dgt"qh'lqwtpcn'kpenmf gf "qpn{ "qpg+" y j lej "o c{ "pqv'tghgeev" y j g"cr r tqcej gu" wugf "kp" uwf lgu"r wdrkuj gf "kp"qy gt "lqwtpcn0' Kp" cf f kkkp."y j g"uwtxg{ "qpn{ "eqxgtgf "uwf lgu"r wdrkuj gf "wpvki'422; 0Vj gtghqtg."c"o qtg"tgegpv" uwtxg{ "ku" pgeguuct { "vq" r tqxkf g" c" y kf gt "r gtur gevkg" d{ "kpenmf kpi " qy gt "lqwtpcn" cpf " eqxgtkpi "y j g"rcuv'hkg" { gctu"kp" qtf gt "vq"i kxg" c"o qtg"ewttgpv'xky "qh'y j g"vgej pls wgu'wugf 0'

Vj g"r tgugpv" uwtxg{ "gzco kpgf "cm'uwf lgu"r wdrkuj gf "kp"y j g"lqwtpcn'qh" y j g"Kvgtpcvkpcn' Uqelgv{ "qh"Ur qtu" P wtkkqp"KUP "+"cpf "KUP GO"."qxgt"y j g"rcuv"9" { gctu"*422: /4236+0Vj gug"y gtg"y j g"qpn{ "y q" f gf lecvgf "lqwtpcn"y j cv"eqxgt"y j g"ctgc"qh"ur qtu"pwtkqp0Vj g" qy gt "lqwtpcn"kp"ur qtv'uekpeg"o clpn{ "hewu"qp"ur qtu"r j { ukqmi { "cpf "o gf kekpg"y kj "c" rko kgt "pwo dgt"qh'uwf lgu"kp"ur qtu"pwtkqp0Vj g"clo "qh'y j ku'tgxky "y cu"vq"kf gpvkh{ "y j g" f kgvct { "ucpf ctf kucvkp"cr r tqcej gu"ewttgpwn{ "wugf "d{ "tgugctej gtu"vq"eqpvqnl'f kgvct { "kpcng" r tg/gzr gtlo gpvcn'tkcn0"

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2.3 Materials and methods

Vj ku'uwwf { "gzco kpgf "cm'gzr gto gpvni'uwf lgu'r wdkuj gf "k"KUP GO "cpf "LKUP "htqo "422: " vq"42360Cp"qpnkpg"ugctej "wukpi "vj g"lqwtpcnu"qy p"y gdukg"y cu"eqpf wevgf 0C"vqcn'qh"57: " ctvengu"y gtg"kf gpvnhgf "k"KUP GO "cpf "49; "k"KUP "y kj k"vj g"ur gekhgf "vko g"r gtlkf 0' Htuw"vj g"vkg"cpf "cdutcev"y gtg"uetggpgf "kf gpvnhgf kpi "vj g"lpenwukqp"etkgtk0Vj g"lpenwukqp" etkgtk"vugf "y gtg<"

3+"Vj g"gzr gto gpvni'rtqvceqn'o wv'dg"cewg'ruvki "rguu'vj cp"46/j qwtu"

4+"Vj g'uwwf { "j cu'vq'dg"qp"j wo cp'uwdlgew"

5+"Vj g'uwwf { "uj qwf "eqpvkpu"cv'rgcu'vy q'gzr gto gpvni'tkcu"

Cm'r knv'uwwf lgu"y gtg"gzewf gf "htqo "vj g"cpn{uku"gxgp"kh"vj g{ "o gg'vj g"cdqngo gpvkpgf " etkgtk" f wg" vq" vj gk" o gvj qf qmji kcn' nko kcvkpu" *g0 0' uco r ng" uk g" qh" qpg+0' Hwvj gt" uetggpki "qh'vj g'o gvj qf qmji { "ugevqp"y cu'r gthqto gf "k"ecug"vj g"lphqto cvkqp"tgs vktgf "y cu" pqv'hqwpf "k"vj g"cdutcev0Co qpi uv'vj qug"kf gpvnhgf "r cr gtu."qpn{ "342"y gtg"grki kdr"htqo " KUP GO "cpf "95"htqo " KUP 0' P gzv." vj g"hm' vgzv' qh' vj g"grki kdr"ctvengu"y cu" hwtvj gt" uetggpgf 0' F cv" gzvcevqp" hqewugf " qp" vy q" o ckp" vqr leu< vj g" cr r tqcej " vq" f kvct { " ucpf ctf kucvqp"cpf "wug"qh'c'r j { ulecn'r gthqto cpeg'r tqvceqn0Rgthqto cpeg'r tqvceqn"y gtg" f kxkf gf "kpv"hxg"i tqwr u0Vj g"f guetk vqp"qh'gcej "i tqwr "ecp"dg"hqwpf "k"Vcdrg"400Vj g" cr r tqcej "vq" f kvct { "ucpf ctf kucvqp"y cu'utcvkhgf "cu'hqmjy <"

*****3+"P ki'qt'o kpkc cni'cr r tqcej 0"

4+"O qpkqtkpi "qh'f kvct { "lvcng"y kj qw'cp{ "tgr nccvqp0"

5+"Ucpf ctf kucvqp"d{ "tgr nccvpi "vj g'f kv'r tkqt"vq"gcej "vkr0"

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Vcdng'4080F guetkr vkp'qh'r gthqto cpeg'r tqvqeqn'

Rgthqto cpeg'r tqvqeqn'	F guetkr vkp'
Cgtqdle"	Vcumi'ncukpi 'mqpi gt 'vj cp'52'o kpwgu'*eqp'kpwqwu+'"
Cpcgtqdle"	Vcumi'ncukpi 'uj qt'gt 'vj cp'52'o kpwgu'*g0 0'ur t'kpvkpi +'qt'ut'gpi vj "dcugf 'cevkxkkgu'*g0 0'ngi 'gz'v'gukqp+'"
Eqo d'kpgf "	Vj g'o gcuwt'go gpv'qh'dq'vj 'cgtqdle'cpf 'cpcgtqdle'ecr'cek'kgu"
Unkmu"	Ur qt'v'ur gek'ke'unkmu'v'guu"
P q'v'guv'	P q'r gthqto cpeg'v'guv'y cu'r gthqto gf "

"

Vj g' :P k'qt' "o k'pko cn'cr r tqcej 0'k'p'ernf'gu'u'w'f'kgu'vj cv'f'q'p'qv'ko r ngo gpv'cp{ "ut'cvgi { "vq" eqpvt'qn'f'kgvt { "k'pvcng" *P knt' "dw' qpn{ "cumu'r ct'v'ekr'cpw'vq'cxqkf "ech'gkpg"cpf "creqj qn'cv' ngcu'46"j qwtu'dghqtg"v'kcm" *O k'pko cn' :cpf "wug'rk'uu'vq"j gr "u'w'ld'geu'cxqkf "egt'v'ckp'hqkf " *Nku'v'0' K' ku' ko r qt'v'p'v' vq' er'ct'kh{ " vj cv' u'w'f'kgu' y j kej " ko r ngo gpv'gf " dgwgt' eqpvt'qmgf " cr r tqcej gu'cnq'cungf " vj gk'r ct'v'ekr'cpw'vq'cxqkf "ech'gkpg"cpf "creqj qn'0'J qy g'xgt. "vj g{ " y gt'g'pq'v'eq'wp'v'gf "cu' :o k'pko cn'0'Uqo g'u'w'f'kgu'rk' k'v'j gk'cr r tqcej "vq'o q'p'k'qt'kpi "u'w'ld'geu'v' f'kgvt { "k'pvcng"tc'vj gt' "vj cp'uc'pf'ctf'k'ukpi "k'0'Vj ku'ku'cej k'gx'gf "gk'j gt'd { "cun'kpi "u'w'ld'geu'vq' nggr "c'hqkf "f'ket { "vj g'f'c { "dghqtg"gecej "v'kcn'qt'd { "eq'pf'w'ek'pi "c'46/j qwt'F_{tgecm}"qp'vj g'f'c { "qh" gcej "v'kcn'0'Vj g'k'p'ht'o c'vkp'ku'vj gp'c'p'cn'ugf "cv'vj g'gp'f "qh'vj g'u'w'f { "cpf "wug'f "vq'g'z'r'ckp' cp{ "wp'g'z'r'ge'v'gf "t'gu'w'v'0'k'p'eq'pvt'cu'v'f'kgvt { "uc'pf'ctf'k'uc'vkp'ku'cej k'gx'gf "d { "t'gr'ck'ec'vkpi "vj g' f'kgv'ckf'gf "d { "qp'g'qh'vj gug'v'gej p'ls'w'gu'<"

3+"Vy gpv{/h'qwt'j qwt'F_{tgecm}"

4+"Y gk'j gf "H_{geqtf}"

5+"Gurko cv'gf "H_{geqtf}"

6+"Uc'pf'ctf'k'ugf "f'kgv"

7+"Uc'pf'ctf'k'ugf "r'tg/v'kcn'o'gcn'

8+"F'kgvt { "r't'guetkr'vkp'""

"

K'ku'ko r qtwcpv'q'pqv'j cv'uo g'uwf kgu'o ki j v'j cxg'uvcpf ctf kugf 'f kgvct { 'kpcng'dw'f kf 'pqv' o gpvkqp'k'kp'y j g'o gjv qf qmji { "ugevkqp0'Vj g'f guetkr vkqp"qh"gej "utcvgi { "ecp'dg'hqwpf "kp" Vcdng"4040'Vj g'f wcvkqp"*>"46"j qwtu"qt"@46"j qwtu+"qh"j g'f kgvct { "ucpf ctf kucvkqp"y cu" gzco kpgf "hqt"j g'hqmjy kpi "vej pls wgu<U_{fkgv}"y gli j gf "H_{geqtf}"cpf "guvko cvgf "H_{geqtf}0"

"

Vcdng"4040'F guetkr vkqp"qh'f kgvct { "ucpf ctf kucvkqp"cr r tqcej gu"

F kgvct { "ucpf ctf kucvkqp" cr r tqcej "	F guetkr vkqp"
46/j qwt'F _{tgecm} "	Rctvlekr cpw"ctg"cong'f "vq"rkuv'cm'hqqf "cpf "ftkpm'eqpuwo gf "qxgt" vj g'r cuv'46"j qwtu"
Y gli j gf "H _{geqtf} "	Uwdlgeu"ctg"cong'f "vq"tgeqtf "cm'hqqf "cpf "hmkf "eqpuwo gf 0'hqqf " y kn'dg'y gli j gf "cpf "hmkf "y kn'dg'o gcuwtgf "dghqtg"eqpuwo r vkqp"
Guvko cvgf "H _{geqtf} "	Uwdlgeu"ctg"cong'f "vq"tgeqtf "cm'hqqf "cpf "hmkf "eqpuwo gf 0' Rqtvkqp" uk'g" ku" swcpvkhgf " wukpi " j qwugj qrf " o gcuwtgu" cpf " f ko gpukqpu"
Uvcpf ctf kugf 'f kgv'	Tgugctej gtu" r tqxkf g" gcej " uwdlgev' y kj " cm' vj gk' hqqf " tgs vkt go gpw'hqt"cv'rgcu'46/j qwtu"kp"cf xcpeg"qh'vukpi "cu'r tg/ r centi gf "o gcm"
Uvcpf ctf kugf 'r tg/vkcn' o gcn'	Tgugctej gtu" r tqxkf g" gcej "uwdlgev'y kj "c"ucpf ctf "o gcn' gk'j gt" eqpuwo gf "vj g'gxgplpi "qt"j qwtu"dghqtg"vj g'vkcni"
F kgvct { 'r tguetkr vkqp"	Tgugctej gtu"vcti gv'qpg"qt"o qtg"pwtkgpv'u+"vj g'f c { u'r tgegf kpi " vj g'vkcni"

"

"

Vj ku'tgxkgy "gzco kpgf "y j gjv gt'uwf kgu'tgr qtvgf "swcpvkcvcxg"qweqo gu'qh'f kgvct { "kpcng"qp" vj g'f c { "dghqtg"gej "vkcni0'Cf f kkpqcm{."vj ku'tgxkgy "cnuq"gzco kpgf "y j gjv gt'tgugctej gtu" gxcnwcvgf " vj g" eqo r rkcepeg" qh" r ctvlekr cpw" vq" vj g" f kgv0' Eqo r rkcepeg" y cu" eqpukf gtgf " gxcnwcvgf "k'h'k'y cu'o gpvkqpgf "kp"vj g'vgzv'f kgvct { "qweqo gu'y gtg'tgr qtvgf "hqt"cm'vkcni."cpf " vj g" uvcpf ctf kugf "r tg/vkcn" o gcn' y cu" eqpuwo gf "kp" vj g" rcdqtcvqt { " y j lej "cuwo gu" vj cv" r ctvlekr cpw'y gtg'wpf gt"uwr gtxkukqp0'Uwf kgu'y cv'wugf "vj g'pki'qt"o kpkcni'cr r tqcej "y gtg" gzenwf gf "h'qo " vj g" cpcn{uku" qh" tgr qtvgf "qweqo gu0' cpf " æeqo r rkcepeg0' Cm'f cv" y gtg" tgr qtvgf "cu'r gtegpvcu gu'cpf "h'gs wgpekgu0'

"

2.4 Results

T guwuu'uj qy gf 'y cv'89' "qh'uwwf lgu'r wdrkuj gf "kp"KLUP GO "cpf '65' "kp"LKUP "ucpf ctf kugf " f kgvct { "kpcng"dghqtg"vkcni0Vj g"cpn{uku"qh'yj g"fkvct { "ucpf ctf kucvkqp"cr r tqcej gu'wugf "ku" uwo o ctkugf "kp"Vcdrg"4050'Kp"y g"ecvgi qt { "qh"df kgvct { "ucpf ctf kucvkqpö."F_{tgecm}"y cu"qpn{ " wugf "d { "qpg'uwwf { "kp"gecj "lqwtpcn'y j gtgcu"H_{geqtf}"y gli j gf "cpf "guko cvgf "eqo dlpqf +."y cu" yj g"rtghgttgf "o gyj qf "hqt"eqpvtqmkpi "fkvct { "kpcng="y ku'y cu'wugf "kp"6; ' "cpf "kp"3: ' "qh" yj g"uwwf lgu'r wdrkuj gf "kp"KLUP GO "cpf "LKUP ."tgur gevkgf "0F gvckgf "cpn{uku"qh'yj g"v{r g" cpf "f wcvkqp"qh"H_{geqtf}"ku'r t gupvgf "kp"Vcdrg"4060"

"

Vcdrg"4050F kgvct { "ucpf ctf kucvkqp"cr r tqcej gu'wugf "kp"lqwtpcn'dgy ggp"422: /4236"

"	F _{tgecm} "	Y gli j gf "H _{geqtf} "	Guko cvgf "H _{geqtf} "	Ucpf ctf kugf "f kgv"	Ucpf ctf kugf "r tg/vkcni' o gcn'	F kgvct { "r tguetkr vkqp"
KLUP GO ""	3'*3' +"	34'*32' +"	68'*5; ' +"	9'*8' +"	36'*34' +"	9'*8' +"
LKUP "	3'*3' +"	2'*2' +"	35'*3: ' +"	8'*: ' +"	; '*34' +"	7'*9' +"

Xcnwgu<p"※ +="p"? "pwo dgt "qh'uwwf lgu"

"

Vcdrg"4060Dtgcnf qy p"qh'H_{geqtf}"wug'd { "v{r g"cpf "f wcvkqp"kp"lqwtpcn'dgy ggp"422: /4236"

"	Y gli j gf "H _{geqtf} "		Guko cvgf "H _{geqtf} "	
"	46/j qwtu"	@46/j qwtu"	46/j qwtu"	@46/j qwtu"
KLUP GO "	7'*6' +"	9'*8' +"	47'*43' +"	43'*3: ' +"
LKUP "	2'*2' +"	2'*2' +"	: '*33' +"	7'*9' +"

Xcnwgu<p"※ +="p"? "pwo dgt "qh'uwwf lgu"

"

Y j gp"eqpukf gtlpi "yj g"i qnf /ucpf ctf "hqt"fkvct { "ucpf ctf kucvkqp."Uf kgv'y cu'wugf "d { "qpn{ " hgy "uwwf lgu"*8' "kp"KLUP GO "cpf ": ' "kp"LKUP +0Vj g"ucpf ctf kugf "r tg/vkcni' o gcn'y cu'o qtg" hts wgpw{ "wugf "cv' ø34' "qh"uwwf lgu0'F kgvct { "r tguetkr vkqp"y cu"qpn{ "wugf "kp' ø8' "qh" tgugetej " uwwf lgu0' Cr r tqzko cvgn{ " 7' " qh" uwwf lgu" kp" dqj " lqwtpcni" o gpvkqpgf " yj g" ko r ngo gpvcvkqp"qh'c'fkvct { "ucpf ctf kucvkqp"vej pls wg'y kj qw'ur gekh{ lpi "y j kej "qpg0'

Vj g"nti guv"r tqr qt vqp" qh'uwwf lgu" *63' + "kp" LKUP "wugf" c" pki' qt" o kpklo cn' cr r tqcej "vq" f kgvt { "ucpf ctf kucvqp" eqo r ctgf "vq" 48' "kp" KUP GO 0' F gvcnrf "cpcn{uku" qh" yj g" -pki' qt" o kpklo cn' cr r tqcej ø'ku'hqwpf "lp" vcdng" 40/0' Uwwf lgu" yj cv' qpn{ "o qpkaqtgf "f kgvt { "kpveng" tcvj gt" yj cp" tgr nkecvpi "yj g" f kgv' eqpukwwgf "9' " *4' "wugf" 46/j qwt "F_{tgecm}" cpf "7' "wugf "H_{geqtf} + "qh" tgugctej "r tqlgew" kp" KUP GO "cpf "39' " *8' "wugf" 46/j qwt "F_{tgecm}" cpf "33' "wugf "H_{geqtf} + "kp" LKUP 0"

"

Vcdng" 40/0' C" dt gcnf qy p" qh" -pki' qt" o kpklo cn' cr r tqcej ø' wug" d { "v{ r g"

" "	P ki'	O kpklo cn'	Nkuv'
KUP GO "	36" *34' +"	35" *33' +"	6" *5' +"
LKUP "	36" *3; ' +"	33" *37' +"	7" *9' +"

Xcnwgu< p" * = p" ? "pwo dgt "qh'uwwf lgu"

"

Vj kt v{ / gki j v' r gtegpv' qh'uwwf lgu" r wdrukj gf "kp" KUP GO "p?: 5+ "cpf "LKUP "p? 66+ "tgr qt vgf " yj g" qweqo gu" qh" yj g" f kgvt { "kpveng" qp" cm' vlcni" *g0 0' gpgti { "cpf "o cetqpwt kpv' kpveng" qp" gcej "vlcni: "y j gtgcu" qpn{ "qpg" yj kf "tgr qt vgf "yj g" eqo r nkepeg" vq" yj g" f kgvt { "ucpf ctf kucvqp 0' Cm quv" j crh" *6: ' + "qh" yj g" uwwf lgu" r wdrukj gf "kp" KUP GO " f kf " pqv" o gcuwtg" r j { ukecn' r gthqto cpeg. "dw' kpuvgcf "yj g{ "o clpn{ "o gcuwtg" r j { ukqni kecn' cpf "dkqni kecn' r etco gvgtu. " y j gtgcu. "48' "wugf" cgtqdle. "42' "wugf" cpcgtqdle. "cpf "8' "wugf" unkmu" vgu0' Vj g" o quv' htgs wgpw{ "wugf" r gthqto cpeg" r tqveqn' kp" LKUP "y cu" öcpcgtqdleö" *58' + "hmqy gf "d { " öcgtqdleö" *4; ' + "öunkmöö" *: ' + "cpf "öeqo dlpf ö" *6' + "y j gtgcu. "qpg" s wctvgt "qh'uwwf lgu" r wdrukj gf "kp" yj g" uco g' lqwt pcnf kf "pqv' wug" cp { ' r gthqto cpeg" r tqveqn0'

"

2.5 Discussion

Vj g" o quv' kpvgt gukpi "hpf kpi "qh" yj g" r tguvpv' uwt xg{ "y cu" yj cv' ø67' "qh" yj g" 3; 5" r wdrukj gf " tgugctej " uwwf lgu" hcnrf "vq" ucpf ctf kug" *qt" f kf " pqv" o gpvqp+ " f kgvt { " kpveng" r tlqt "vq" gzt gto gpvcn' vlcni 0' Vj gtg" ctg" yj tgg' ko r qt vcpv' r quukdrkku" y j { "tgugctej gtu" f gekf gf "pqv" vq" ucpf ctf kug" f kgvt { "kpveng 0"

Hktuwn{."uqo g"tgugctej gtu"o c{"pqv"tgeqi plug"vj g"ko r qtvcepg"qh"flgvt{"ucpf ctf kucvkqp0
 Vj ku"o ki j v'dg"vj g"ecug"ht"vj g"39' "qh'uwf kgu"r wdrkuj gf "kp"LUUP"vj cv'f kf "pqv"ko r ngo gpv"
 cp{"cr r tqcej "f gur kg"o gcuwtkpi "r j {ukecn'r gthqto cpeg"cu"o c"o clp"qweqo g0'Ectdqj {f tcvg."
 kp"r ctvwet."ku"y gmlhpqy p"vq"cngt"gpf wtcepg"r gthqto cpeg"*J cy ng{"gv'cr03; ; 9=Eqtgkc/
 Qrxgkct"gv'cr04235="Gtrgpdwuej "gv'cr04227+"cpf "r j {ukqmi kcn'tgur qpugu"*O cf ugp"gv'cr0
 3; ; 2="Rkukrf ku"gv'cr03; ; 8+0K"j cu"dggp"uj qy p"vj cv'f cln{"ectdqj {f tcvg"lpvcng"eqwf "xct{"
 d{"45' "P gnuqp"gv'cr03; ; ; =Dkpi j co "3; : 9+y j lej "kpetgcugu"vj g"r quukdkk{"qh'uwdlgeu"
 eqpuwo kpi "y q"flgw"y kj "uki pkhecpvn{"f hgtgpv'ectdqj {f tcvg"eqpvgpv'f wtkpi "vj g"46/j qwt"
 r tgr ctcvkp"r gtkqf "dghqtg"tkcn0Hwtvj gto qtg."hckkpi "vq"eqvtqn'creqj qn'lpvcng"vj g"pki j v"
 dghqtg"gzr gtko gpvnr'vtnu"eqwf "cngt"pgzv'f c{"r j {ukecn'r gthqto cpeg0'Qdtkgp"*3; ; 5+"
 tgr qtvf "c" tgf wewkp" kp" cgtqdle" r gthqto cpeg" d{" 3306' " 46/j qwtu" chgt" creqj qn'
 eqpuwo r vkp0Vj g"qpni "gzegr vkp"y j gtg"flgvt{"ucpf ctf kucvkqp"o c{"pqv"dg"tgs wktgf "ku"
 y j gp"vj g"qweqo gu"o gcuwtgf "ctg"pqv'f kgevn{"qt"kp'f kgevn{"chgevgf "d{"cewg"ej cpi gu"kp"
 flgvt{"lpvcng0Gzco r ngu"lpenmf g"uwf kgu"o gcuwtkpi "j gctv'tcvg"xctkcdkkn{"cv'tguv"*Uej o kw'
 gv'cr0422: +"qt"dmqf "dkqo ctngtu"uwej "cu"lpvgtngwnp/8"cpf "E/tgcevkg"r tqvgk"*Rggkpi "gv"
 cr0422; +0"

Ugeqpf n{."tgugctej gtu"o c{"pqv"j cxg"vj g"gzr gtvkug."hwpf u'qt"vko g'tgs wktgf "vq"ko r ngo gpv"vj g"
 i qrf/ucpf ctf "flgvt{"ucpf ctf kucvkqp"vej pls wg0Ucpf ctf kugf "r tg/r centi gf "o gcn"o ki j v"
 dg"equm{"cpf "vko g"equwo kpi "Igeqeng"("Dwtng"4232+0J qy gxgt."kh'c"rcti g"ghgevn'uk'g"ku"
 gzr gevfg "f wtkpi "vj g"uwf {"cpf lqt"vj g"flgv"j cu"mgy "ko r cev"qp"vj g"lpvgtxgpvkp"vj gp"
 cngtpcvkg"o gvj qf u'ecp"dg"wguf."uwej "cu"vj g'y gli j gf "H_{geqtf}0"

Vj kfn{."uqo g"tgugctej gtu" o c{"pqv" eqpukf gt" flgv" vq" j cxg" cp{" kphwgepg" qp" vj g"
 gzr gtko gpvnr'tqvqeqn'wguf 0Cu"o tguwn."r ctvlekr cpw'ctg"qpni {"cungf "vq"cxqkf "echhgkpg"cpf "
 creqj qn'f wtkpi "vj g"vtnr' tgr ctcvkp"r gtkqf "qt"vj gkt"flgvt{"lpvcng"y kn'dg"o qpkaqtgf "tcvj gt"
 vj cp"dgkpi "ucpf ctf kugf 0Vj ku"cr r tqcej "o ki j v'dg"uwxcdng"ht"ukpi ng"dqww."j ki j "lpvgpukv{"
 r gthqto cpeg"vguu"*g0 0Y kpi cvg"vgu"vj cv'ruu"52"ugeqpf u+"dw'pqv'ht"mipi gt"flwcvkqp"*@7"
 o kpwgu"J cy ng{"gv'cr03; ; 9+0Vj g"tgxkgy "eqpenmf gf "vj cv"o wuerg"i n'eqi gp"ku"pqv"o"
 rko kkpki "hcevt"qh"gpf wtcepg"ecr cekv{"gz gtekugu"ruukpi "ngu"vj cp"hxg"o kpwgu"y j gp"r tg/
 gz gtekug'rgxgnu"ctg"y kj kp"vj g'pqto cnlcp i g0"

Qh"vj g"¢77' "uwf kgu"y j q"flkf "eqvtqn'flgvt{"lpvcng."vj g"o quv'htgs wgpvn{"wguf "vej pls wg"
 y cu"vj g"guvko cvgf "H_{geqtf}."y j kg"vj g"ngcu"wguf "y cu"F_{tgecn}0Tgcuqpu"y j {"guvko cvgf "H_{geqtf}"
 go gti gf "cu"vj g"o quv'r qr wrct"r tqvqeqn' o c{"lpenmf g"ku"mgy "equv'eqo r ctgf "vq"U_{flgv}"cpf "

tgf wegf "dwtf gp"qp"uwlgeu0'k'cf f k'kp. "vprkng"vj g"46/j qwt "F_{tgecm}"vej pls wg. "H_{geqtf}"f qgu"pqv'tgs vkt g"cp {"g zr gt vktg"kp"kp vgt xky kpi "cpf "f qgu"pqv'tgn {"qp"o go qt {"tgf wekpi "y g"pwo dgt"qh"gttqtu"kp"tgecm"Vj qo r uqp"("D{gtu"3; ; 6="Drcem'4223="lgceqeng"("Dwtng"4232="O ci nqu"(" [c p p c m q w k c "4225+0'Qpg"wp c p v k e r c v g f "h k p f k p i "y c u "y j c v "q p n {"9' "qh"u w f k g u "w u g f "u c p f c t f k u g f "f k g v "f g u r k g "y j g "e q p u k f g t c d n g "p w o d g t "q h "u w f k g u "y j q "t g s v k t g "u t l e v "e q p t q n "q h "f k g v c t {"k p v n g 0 ' C "r q u u k d n g "g z r n c p c v k p "h q t "y j k u "o k i j v 'd g "y j g "e q u v "c p f "v k o g "t g s v k t g f "v q "r t g r c t g "y j g "o g c n u 0 ' O q t g x g t . "k ' t g s v k t g u "g z r g t v k t g "v q "f g u k i p "c "f k g v "r n c p " * l g c e q e n g " (" D w t n g "4232+0'k' "h c e v . "o q t g "u w f k g u "w u g f "c "u c p f c t f k u g f "r t g / v t k n ' o g c n ' t c v j g t "y j c p "u c p f c t f k u k p i "y j g "f k g v "h q t "c "r g t k q f "q h "c v 'r g c u v "46/j q w t 0' K' k u "e q p u k f g t g f "e j g c r g t . "t g s v k t g u "r k w n g "v k o g "h q t "r t g r c t c v k p . "c p f "p q "g z r g t v k t g "k u "t g s v k t g f 0' C m "u w l g e u "p q t o c m {"t g e g k x g "y j g "u c o g "o g c n "w u w c m {"c u "c "u p c e m " * D g g n g p "g v 'c r 0'422; +0' C n j q w i j "c "r t g / v t k n ' o g c n ' e c p "j g r r "v q "t g u q t g "n q y "q t "u w d / q r v k o c n i n { e q i g p "u q t g u "d g h q t g "v t k n u " * P k n u q p " (" J w n o c p "3; 95="E q { n g "g v 'c r 0'3; : 7+ "k ' e c p p q v "e q t t g e v "c "f k h g t g p e g "k p "v q c n ' d q f {"i n { e q i g p "u q t g "c u "k "e q p t k d w g u "v q "y j g "u c o g "c o q w p v "q h ' e c t d q j {"f t c v g "d g h q t g "g c e j "v t k n 0' "

F k g v c t {"u c p f c t f k u c v k p "v g e j p l s w g u "c t g "w u g h w i "v q n u "y j c v "j g r r "t g f w e g "x c t k c d k k v {"k p "f k g v c t {"k p v n g "d g y g g p "v t k n 0' J q y g x g t . "y j g "f k g v "i k x g p "o c {"p q v "c n y c {"u "d g "u t l e v {"h q m y g f "d {"c m "t g u g c t e j "u w l g e u 0' l g c e q e n g "c p f "D w t n g " * 4232+u j q y g f "y j c v "y j g "y k j k p / u w l g e v "x c t k c d k k v {"k p "e c t d q j {"f t c v g "k p v n g "y c u "d g y g g p "20' c p f "30' "i 0 m i ^{/3} "d q f {"y g k i j v 'y j g p "g u k o c v g f "H_{geqtf}"y c u "w u g f 0' V q "r w 'k 'k p v q "e q p v g z v "c "r c t v k e r c p v "y j q "y g k i j u '97' m i "e c p "e q p u w o g "342i "o q t g "e c t d q j {"f t c v g "y j g "f c {"d g h q t g "q p g "v t k n ' e q o r c t g f "v q "y j g "q v j g t 0' F g u r k g "y j g u g "h k i v t g u . "ø87' "q h "u w f k g u "r w d r k u j g f "k p "K L U P G O "c p f "L K U P "g k j g t "f q "p q v "e j g e m i "u w l g e v u "e q o r r k c p e g "v q "y j g "f k g v "i k x g p "q t "f q "p q v "o g p v k p "k 0' V j k u "k p e t g c u g u "y j g "t k u n ' q h "u w l g e u "y k j "r q q t "e q o r r k c p e g "c f f k p i "p q k u g "v q "y j g "t g u w n u "c p f "f g e t g c u k p i "g z r g t k o g p v c n i r q y g t 0'

C r r t q z k o c v g n {"87' "q h "u w f k g u "h c k r g f "v q "t g r q t v "s w c p v k c v k x g n {"y j g "q w e q o g u "q h "f k g v c t {"k p v n g "f w t k p i "y j g "v t k n ' r t g r c t c v k p "r g t k q f u 0' V j k u "r t q x k f g u "c p "k f g c "y j g v j g t "y j g "c x g t c i g "k p v n g u "c t g "e q o r c t c d n g "v q "q v j g t "u k o k r c t "i t q w r u "k p "y j g "r q r w c v k p 0' J q y g x g t . "k p "y j g "o c l q t k v {"q h "t g u g c t e j "u w f k g u . "y j g "c x g t c i g "x c n w g u "c t g "p q v "u k i p k h e c p v n {"f k h g t g p v "d g y g g p "e q p f k k q p u " * D q p f "g v 'c r 0'4234="O c e f g t o k f "g v 'c r 0'4234+0' Y k j k p / u w l g e v "x c t k c d k k k u "c t g "q h n g p "o c u n g f "d {"y j g "c x g t c i g "x c n w g u 0' K g c m {"c "v c d n g "k p e n f k p i "k p f k x k f w c n ' x c n w g u "c p f "c "e q n w o p "t g r q t v k p i "y j g "f k h g t g p e g "k p "g p g t i {"c p f "o c e t q p w t k p v "k p v n g u "d g y g g p "v t k n u "u j q w r f "d g "u j q y p "k p "y j g "t g u g c t e j "r c r g t 0' Q p n {"q p g "r w d r k u j g f "u w f {"k p e n f g f "y j k u "v {r g "q h "v c d n g " * N {p e j "4235+0' T g u g c t e j g t u "u j q w r f "d g "g p e q w t c i g f "v q "k p e n f g "y j g "v c d n g "k p "y j g k t "r c r g t "g u r g e k c m {"y j g p "f k g v

ecp"j cxg"uki p~~h~~ecpv~~l~~phwpeg"qp"vj g"uwf { "qweqo gu0J qy gxgt."ku~~l~~penwukp~~l~~ku~~l~~ko kgf "d { "

vj g"o czko wo "y qtf "eqwpv"cpf kqt"pwo dgt"qh"cdrgu"cmqy gf "d { "uelgp~~h~~le"lqwtpcnu0"

C"pqvcdng"fhgtgpeg"y cu"qdugt~~x~~gf "lp"vj g"s wcrk~~v~~ { "qh"vj g"cr r tqcej gu"uwf "lp"dqvj "lqwtpcnu0"

Vy gpv~~/~~hxg"r gtegpv"o qtg"uwf lgu"ucpf ctf kugf "f kgvt { "lpvcng"lp"KUP GO "eqo r ctgf "vq"

LKUP "f gur kg" vj g" rwtg" o gcuwtlpi " r j { ulecn" r gthqto cpeg" cpf " tgrv~~g~~f " r j { ukqmi lecn"

tgur qpugu" lp" 97' " qh" tgugctej " r tqlgew" eqo r ctgf " vq" 72' " lp" vj g" hqto gt0' Rj { ulecn"

r gthqto cpeg" ku" j ki j n~~l~~ "phwpegf "d { "ugxgtcn" f kgvt { "hcevqtu" *Dgm~~l~~ (" O eNgmcp" 4224="

Q0Dtlgp" 3; ; 5+" cpf " vj gkt "xctk~~v~~kp" dgwy ggp" vlcnu" *Eqt~~t~~gk/Qrkxgk~~c~~ " gv" cn0' 4235=" vj wu."

dgwgt" ucpf ctf kuc~~v~~kp" ku" tgs wktgf 0' K~~i~~ wpeqptqmgf." dqvj " y kj lp/" cpf " dgwy ggp/uwdlgevu"

xctkcdk~~v~~ { " lp" r gthqto cpeg" y km' kpetgcug." ngcf lpi " vq" c" f getgcugf " ghgev" uk~~g~~." j gpeg"

kp~~c~~f gs wcv~~g~~" gzi gtlo gpv~~n~~" r qy gt " *Cv~~k~~puqp" (" P gxkm' 4223=" J qr nkpu" gv" cn0' 3; ; ; +0' Cu" c"

tguw~~l~~ "hcnug" eqpenwukpu" o ki j v" dg" f tcy p0' Ucpf ctf kugf "f kgv" uj qwf "dg" uwf "cu" c" f ghcv~~l~~"

o gvj qf " lp" vj gug" v~~r~~ gu" qh" uwf lgu" vq" o k~~p~~ko kug" xctkcdk~~v~~ { 0' C" urki j v" f fhgtgpeg" ecp" dg"

qdugt~~x~~gf "lp" vj g" lo r cev" hcevqtu" qh" dqvj "KUP GO "cpf "LKUP " *406" cpf " 30 . "tgur gev~~x~~gn~~l~~ . "lp"

42364237+0' K~~p~~ "cf f k~~k~~qp." o cp { " qh" vj g" r wdrkuj gf "ctv~~l~~engu" lp" LKUP " kpenw~~g~~" eqo o gtekn"

r tqf wew0' Vj ku" o ki j v' r ctv~~l~~cm { "gzi r~~l~~kp" vj g" r~~l~~cm' qh" f kgvt { "ucpf ctf kuc~~v~~kp" lp" vj gug" uwf lgu0'

O qtgxgt. "34' "qh" uwf lgu" lp" LKUP "uwf "ucpf ctf kugf " r tg/vlc~~n~~" o gcn' *gxgp~~l~~pi " cpf " r tg/

gzgtekug+" y j k~~l~~ej " o gcpu" f kgvt { " lpvcng" o c { " pqv" dg" hwm~~l~~ { " eqpvtqmgf " f wtkpi " vj g" vlc~~n~~"

r tgr ctcv~~l~~kp" r gtkqf 0' Eqpugs wgpv~~l~~ . "qp~~n~~ { " qpg" lp" vj tgg" tgugctej " r tqlgew" j cxg" eqpvtqmgf "

f kgvt { "lpvcng" hqt" cv" r~~l~~cu~~v~~46/j qwt" eqo r ctgf "vq" qpg" lp" vy q" tgugctej " r tqlgew" lp" KUP GO 0'

Vgp" r gtegpv" qh" uwf lgu" lp" KUP GO " uwf " y gli j gf " H~~g~~eqtf " eqo r ctgf " vq" 2' " lp" LKUP 0'

Y gli j gf " H~~g~~eqtf " j cu" dggp" uj qy p" vq" dg" c" o qtg" ceewtcv~~g~~" v~~g~~ej pks w~~g~~" vj cp" vj g" guko cvgf "

o gvj qf " *Y qn~~g~~ t" gv' cn0' 3; ; 7+0"

"

2.6 Conclusion

Dcugf "qp" vj ku~~t~~gxkgy "gzco k~~p~~lpi "cm' gzi gtlo gpv~~n~~" uwf lgu" r wdrkuj gf "lp" KUP GO "cpf "LKUP "

dgwy ggp" 422: "cpf "4236. "k~~y~~ cu" eqpenw~~g~~ gf "vj cv' o cp { "uwf lgu" *55' " lp" KUP GO "cpf "79' " lp"

LKUP "+" f k~~f~~ " pqv" lo r ngo gpv" c" f kgvt { "ucpf ctf kuc~~v~~kp" v~~g~~ej pks w~~g~~" vq" eqpvtqn' gpgti { " cpf "

o cetqpwtl~~g~~pv" lpvcngu0' Co qpi uv" vj qug" vj cv' f k~~f~~ . "c" uwducpv~~l~~cn" pwo dgt " *7 " 67' "+" gkj gt " f k~~f~~ "

pqv' ej gem~~h~~qt "eqo r rlcpeg" qt " f k~~f~~ " pqv' o gp~~v~~kp" k0'

"

Chapter 3

The reproducibility of a diet using three different dietary standardisation techniques in athletes

3.1 Summary

Rctvlekr cpwu"ctg"qhngp"cumgf "vq"tgr nlecvg"vj gkt"fkgv"dghqtg"gej "vlecn"kp"qtf gt"vq"eqpvtqn" fkgvct{"kpcvng"J qy gxgt."rkwrng"ku"npqy p"cdqww"vj g"tgr tqf weklkrk{"qh"vj g"fkgv" wulpi " fkhgtgpv"cr r tqcej gu0Vj g"clo "y cu"vq"cuugui"vj g"tgr tqf weklkrk{"qh"v" fkgv"y j gp"U_{fkgv}"H_{geqtf}" cpf "46/j qwt" F_{tgecm}"y gtg" wugf "cu" fkgvct{"ucpf ctf kucvqp" vgej pls wgu0 Vj ktv" cy ngvu" eqo r ngvgf "ukz"xkuku"vq"vj g"rdqtcvqt{0Qp"vj g"htuv"qeeucukp" c" F_{tgecm}"y cu"r gthqto gf "cpf " uwdlgeu"y gtg"cumgf "vq"tgr nlecvg"gzcevn{"vj g"uco g"fkgv"qp"vj g"fc{"dghqtg"Xkuk"4."y j gp" cpqj gt" F_{tgecm}"y cu"r gthqto gf 0Vj g"fc{"r tkqt"vq"vj g"vj kf "xkuk."uwdlgeu"eqo r ngvgf "c" H_{geqtf}." y j lej "y cu"r tguvgf "cv"Xkuk"5"cpf "cuuguugf "wulpi " F_{tgecm}"kp"qtf gt"vq"gpuwtg"eqo r ctedkrk{" dgwy ggp"o gvj qf u0Uwdlgeu"y gtg"cumgf "vq"tgr nlecvg"vj ku" H_{geqtf}"dghqtg"Xkuk"6"y j lej "y cu" cuuguugf "wulpi " F_{tgecm}"Ncum{"."uwdlgeu"y gtg"r tqxkf gf "y kj "c" U_{fkgv}"qh"npqy p"eqo r qukvqp" y j lej "vj g{"eqpuwo gf "hqt"46/j qwtu"dghqtg"Xkuk"7"cpf "80Hqt"gej "o gvj qf ."vj g"fkhgtgpeg" kp" gpgti {"cpf "o cetqpwtlcpv" kpcvngu" dgwy ggp" dqj " qeeucukpu" y cu"o gcuwtgf 0 F gur kg" hpf lpi "pq"fkhgtgpegu"kp"o gcp"gpgti {"cpf "o cetqpwtlcpv" kpcvngu" dgwy ggp"xkuku" hqt"cp{" vgej pls wg."ko r qtvcv"y kj kp/uwdlgev"fkhgtgpegu"y gtg"cr r ctgp0Vj g"tcpi g"qh"r gtegpvi g" eqghlelcpv"qh"xctkcvqp" hqt"cm"xctkcdngu"y cu"dgwy ggp"40/70 " "hqt"U_{fkgv}"320/3: 08 " "hqt" H_{geqtf}."cpf "90/330 " "hqt" F_{tgecm}"0Vj ku"uwf {"j cu"uj qy p"vj cv"U_{fkgv}"ku"vj g"dgu"cr r tqcej "vq" ucpf ctf kug"fkgvct{"kpcvng."gur gekcm{"y j gp"vj g"gzr gevfg "ghgev"qh"cp"kpvtxgpvqp"ku"uo cm" cpf "cp"gpj cpegf "tgrkcdkrk{"ku"tgs wktgf.

3.2 Introduction

Vj g"qweqo gu"qh"v"tgugetej "uwf {"y j gtg"j wo cp"uwdlgeu"ctg"cumgf "vq"r gthqto "c"r j {"ulecn" vumlecp"dg"kp"hwpegf "d{"j qy "gej "uwdlgev"r tgr ctgu0Hqt"gzco r ng."c"uwf {"vj cv"o gcuwtgu" vj g"ghgev"qh"echgkpg"qp"r j {"ulecn"r gthqto cpeg"o wuv"gpuwtg"vj cv"uwdlgeu"dgi kp"vugkpi "kp"v" uko kct"ucvg"qh"r tgr ctgf pguu0K gcm{"."uwdlgeu"uj qwf "dg"vugvf "kp"cp"kf gpvlecn"ucvg"qh" pqwtkuj o gpv"cpf "j gcnj "kp"qtf gt"vq"r tguvtg"kpvtpcn"xcrkf k{0Kpvtpcn"xcrkf k{"o gcpu"vj cv" vj g"qweqo gu"qdugtvgf "g0 0"ko r tqxgo gpv"kp"vko g"vlecn"ctg"ecwugf "d{"vj g"kpvtxgpvqp" *g0 0"echgkpg="Lgceqeng"("Dwtng"4232+0Vj gtghqtg."fkgv"pggf u"vq"dg"ucpf ctf kugf "kp"qtf gt" vq"o kpk kug"vj g"ghgev"qh" fkhgtgpv" fkgvct {"eqo r qpwp" *g0 0"gpgti {"ectdqj {f tcv"cpf " echgkpg"npqy p"vq"j cxg"cp"ko r cev"qp"vj g"qweqo gu"qh"vj g"uwf {"*ugg"ugevqp"304+0Hckkpi " vq"eqpvtqn"qt"grko kpcvg"vj gug"ncevtu"ecp"ngcf "vq"hcng"eqttgrcvkpu"cpf "lpeqttgev"tguwu0

Ugxgtcn'uwf lgu"j cxg" f go qputcvgf "vj cv'hckrkpi "vq"ucpf ctf kug"r ctvlekr cpwu" f lgv"qp"vj g" f c { " dghqtg" wtkpg" uco r ng" eqmgevqp" kpetgcugu" xctkcdkrk { " kp" vj g" wtkpct { " o gvcdqke" r tqhkg" *Y cnj "gv'cn0'4228="Ngp| "gv'cn0'4225+0'Hwtvj gto qtg."vj g"lpcdkrk { "vq"eqpvtqn'creqj qn'kpcvng" tgf wegu" cgtqdle" r gthqto cpeg" d { "3306" "gxgp"46/j qwtu" chgt" ku" eqpuwo r vkp" *QdDtkgp" 3; ; 5+0'Tgugctej gtu"uj qwf "vj gtghqtg"vng"gz vtc"o gcuwtgu"vq"luqrvg"vj g"qweqo gu"qh"vj g" uwf { "htqo "vj g"gz vtcpgqwu"xctkcdngu0'

kp" y gm/eqpvtqngf " etquuxgt" f guki p" uwf lgu." r ctvlekr cpwu" ctg" cungf " vq" eqpuwo g" vj gkt" j cdkwcn' f lgvct { "kpcvng"r tkqt"vq"vj g"htuv'vkn'cpf "vj gp"vq"tgr rdecvg"vj g"uco g" f lgv"r tkqt"vq" gxgt { "uwdugs wgpv'vkn0'Vj g"cko "ku"vq"o kpo kug"vj g"xctkcdkrk { "kp" f lgvct { "kpcvng"dgy ggp"vj g" r tg/vkn'r tgr ctevkp"r gtkqf u0'Tgugctej gtu"o c { "wug" F_{tgecm} "cpf" H_{geqtf} "vgej pls wgu"cu"cp"ckf " vqqn"vq"j gr "uwdlgeu"tgr rdecvg"vj gkt" f lgv0'K gcm { . "vj g { "uj qwf "wug"vj g"U_{flgv}"cr r tqcej "y j kej " eqpukwu"qh"r tqxkf lpi " r tg/r cemi gf "o gcm"vq" r ctvlekr cpwu" hqt"eqpuwo r vkp" dghqtg" gcej " vkn0"

Tgugctej gtu"qhvgp"vng" hqt" i tcvvgf " f lgvct { "ucpf ctf kucvkp0'Vj ku"j cu"dgpp"j ki j rki j vgf "d { " vj g"pwo dgt"qh"uwf lgu"y j q" f q"pqv"ej gem"vj g"eqo r rncpeg"qh"vj gkt" r ctvlekr cpwu"vq"vj g" f lgv" *ugg"ugevkp"406+0'Ur qt v'uelgpeg"uwf lgu"kp" r ctvlewrt"qhvgp"j cxg" c"uo cni'uco r ng"uk" g" f wg"vq" vj g"qhvgp"gzj cwukxg"pcwtg"qh"vj g"gz gtekug"r tqvceqn'cpf " f khlwv { "vq"tgetwk"r ctvlekr cpwu." y j kej "o cngu"kv'o qtg" f khlwv"vq" f ggev'uki plhlec p'v'ej cpi gu"kp"vj g" r tgugpeg"qh"qwnkgtu"cpf " r ctvlekr cpwu" y kj " r qqt" eqo r rncpeg" vq" vj g" f lgv" i kxgp0' F lgvct { " xctkcdkrk { " kp" uwdlgev" r tgr ctevkp"ku" c" r qvgpkn' uqwtg"qh" gttqt"vj cv'o c { "kphwpeg"r tko ct { "o gcuwtgo gpwu" d { " kpetgcukpi " uki pcn' pqkug" cpf " tgf welpi " gztgtko gpvn" r qy gt" *Dtcwp" (" Dtqqm" 422: = " Lgceqeng" (" Dwtng"4232+0'Y j cv'ku"pqv" { gv'engct"ku"vj g"o ci pkwf g"qh"vj g" f khtgpegu"kp" r ctvlekr cpwu" gpgti { " cpf " o cetqpwtlgpv" kpcvngu" dgy ggp" vkn" y j gp" vj g" vj tgg" cdqxgo gpvkpgf "cr r tqcej gu"ctg" wugf 0'Vj gtghqtg."vj g'o ckp"cko "qh"vj ku"lpxguki cvkpy"cu"vq" cuuguu"vj g" tgr tqf weldkrk { "qh" c" f lgv" y j gp" U_{flgv}." H_{geqtf} "cpf" F_{tgecm} "y gtg" wugf "cu" f lgvct { " ucpf ctf kucvkp"vgej pls wgu0'

3.3 Materials and methods

3.3.1 Participants

Vj kv{/hwt" o qf gtcvgn{/ "cpf" y gm/vtckpgf " o crg" cyj ngvu" htqo "hxg" f khtg gpv" f kuekr nkpgu" *tqy kpi <43. "vtckvj nqp<9. "e{enlpi <5. "twppkpi <4. "cpf "hqqvdcn<3 +r ctvlekr cvgf "kp" yj ku'uwf {0' Cj ngvu" y gtg'tgetwkgf "htqo "ur qt w'enwdu"kp" Qzhqtf uj ktg" yj tqwi j "yj gkt'tgur gevkg" eqcej gu0' Vj kv{/ "cyj ngvu" eqo r ngvf "yj g" uwf { "o gcp" ŌUF <ci g"? "47" Ō8" {t. "dqf { "o cuu"? "9804" Ō; 07" mi. "j gli j v"? "3: 2" Ō'9" eo + "cpf "hwt" y kj f tgy "htqo " yj g" uwf { "hqt" r gtupcn' tgcuppu0' Grki kdkkv{/ "etkgtk" kpenwf gf <"

- Cyj ngvu" ci gf "dgy ggp" 3: /62" { gctu"
- Kpxqrxgf "kp" c' vgo "qt" gpf wtcepg" v{ r g' cevkxkv{/ "
- Vtckkpi "x" 7" j qwtu' r gt' y ggm'
- P qv' cmgti k" qt' kpvrngt cpv' vq' hqqf "r tqxkf gf "
- Htgg" qh" o gxcdqrk" f kuqtf gtu" *gd 0' f kcdggu. " ectf kqxcuewct" f kugcug. " qt" j { r gtvpukqp+0"

C" o kpk wo "qh" 42" r ctvlekr cpw" y cu" tgs wktgf "hqt" uco r ng" uk g" hqt" r tgekug" guvko cvg" qh" EX" cpf "ET" *Cvnpukp" ("P gxkm" 4223 + "j qy gxgt. "52" r ctvlekr cpw" y gtg" tgetwkgf "vq" ko r tqxg" ucvkuecn' r qy gt0' Vj ku'uwf { "y cu" eqpf wevgf "ceeqt f kpi "vq" yj g" i wkf gnpku" rckf "f qy p" kp" yj g" F gerctvkap" qh" J gnukpnk' cpf "cm' r tqegf wtgu" kpxqrxkpi "j wo cp" uwdlgeu" y gtg" cr r tqxgf "d { " yj g" Wpkxgtuk { "Tgugctej " cpf "Gj leu" Ego o kvgg" *WTGE + "cv" Qzhqtf "Dtqqngu" Wpkxgtuk { " *Crr gpf kz "C+0Y tkwgp" kphqto gf "eqpugpv' y cu" qdvckpgf "htqo "cm' r ctvlekr cpw" r tkqt "vq" yj gkt" r ctvlekr cvkqp0'

"

3.3.2 Experimental design

Rctvlekr cpw" eqo r ngvf "ukz "xkuku" vq" yj g" rcdqtcvqt { "vq" cuuguu" yj g" tgr tqf wekdkrkv{/ "qh" c' f kgv" yj gp" U_{fkgv} " H_{tgeqtf} " cpf " F_{tgecm} " y gtg" wugf " cu" f kgvct { " ucpf ctf kucvkap" vgej pls wgu0' Tgr tqf wekdkrkv{/ "kp" yj ku" eqpvzv" eqpukvgf " qh" vy q" o ckp" hcevqtu" eqpvtkdwkpi " vq" yj g" xctkcdkrkv{/ "qh" f kgvct { "kpvcng0' Vj g" hktuv' y cu" yj g" cdkkrkv{/ "qh" r ctvlekr cpw" vq" tgr rdecvg" yj g" f kgv" cpf "yj g" ugeqpf "eqpukvgf "qh" yj g" ej cmgpi gu' yj cv' gcej "vgej pls wg' r rneg" qp" r ctvlekr cpw0"

Vj g"gzr gtlo gpvcl'f guki p"ku"uwo o ctlugf "dgnqy "kp"Hki wtg"500Rctvlekr cpw'y gtg'y gli j gf " qp" xkuku"3"vq"208"mi "pgct"rtgekukqp"kp"rki j v'enqyj kpi "cpf" dctghqqv'wukpi "c"ecrkdtevgf " grgetqppe"uecrg" *Vcpkic"WM'Nvf0" [lgy urg{."O kff ngugz."WM+0'J gli j v'y cu"o gcuwtf " y kij qww'uj qgu'y kij "cp"ceewtce{"qh"207"eo "wukpi "c"ucf kqo gvgf "Ugec"Nvf0"Dkto kpi j co ." WM+0'Tcpf qo kucvqp"y cu"pqv'r quukdng"cu"kw'y qwrf "j cxg"eqo r rkecvgf "vj g"f guki p"qh"vj g" uwwf {"d{"kpetgculpi "vj g"pwo dgt"qh'xkuku"*ugg'ugevqp"507+0'Vj g'o gcp"f wtcvqp"qh"vj g"uwwf {" hqt"r ctvlekr cpw'y cu"42"Ö'6"fc{u0"Vy gpv{/hqt"j qwt"o wnk r ng"r cuu"o gyj qf "hqt"F_{tgecm}"y cu" wugf "cv"xkuku"3."4."5."cpf"6"vq"i gpgtcvg"r tlo ct{"fcw"cpf "hqt"eqo r ctedkkr{"dgwy ggp" o gyj qf u0'Vj g"f hgtgpeg"kp"gpgti {"cpf"o cetqpwtlcpv"kpvcngu"dgwy ggp"dqyj "xkuku"hqt" F_{tgecm}"cpf "H_{tgeqtf}"o gyj qf u"y cu"vj gp"o gcuwtf0'Hqt" c"eqo r ngv"cpf "ceewtcvg"f lgvct{" cuuguuo gpv."gcej "kpvgtxkgy "vqnm'dgy ggp"42"vq"52"o kpwgu"vq"eqo r ngv0Rctvlekr cpw'y gtg" kphqto gf "vq"nggr "vj gk"vtclpki "cu"uko krt"cu'r quukdng"vj g"fc{"dghqtg"gcej "xkuku"kp"qtf gt"vq" tgf weg'ku'kphwpgpeg"qp"f lgvct{"kpvcng0'

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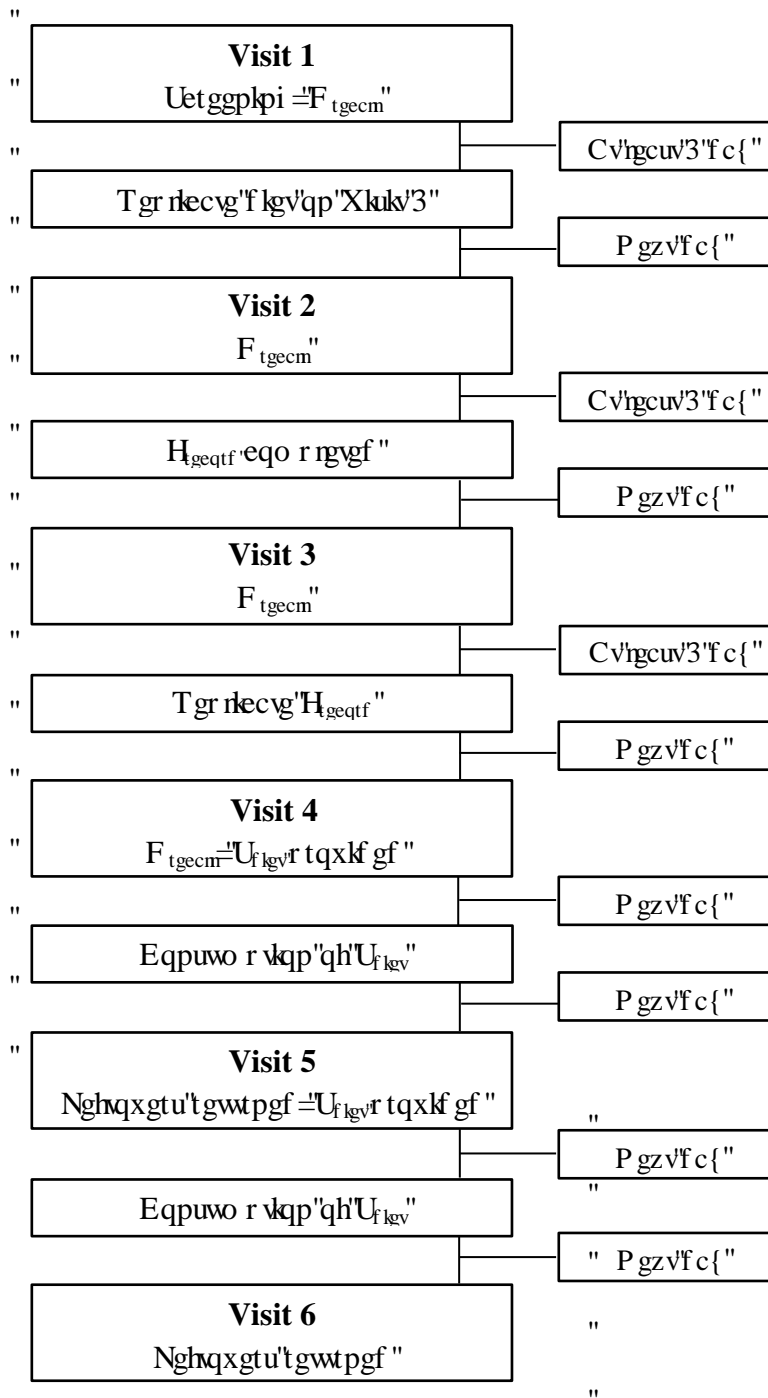
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Hki wtg"5080Uwo o ct { "qh"vj g"gzr gtlo gpwcnf guki p0'

Vj g"o wnr ng"r cuu"o gjy qf "y cu" wugf "cu" cp" ckf "vq" vj g" F_{tgecm} "kp" qtf gt "vq" kpetgcug" vj g" ceewtce { "qh"vj g" f c v c "eqmgev f " *O quij hgi j "gv" cr0422: +0' Vj g"o wnr ng"r cuu"o gjy qf "j cu" crtgcf { "dggp" f guetkdgf "kp" uge vqp "300400C" r j qvqi tcr j le "hqqf "cvru"y cu" wugf "hqt"r qt vqp" uk gu"kp" qtf gt "vq" guko cvg"vj g"co qwpv'qh'hqqf "equpuwo gf " *Cv'kpup"gv"cr04224+0'

J cdkwcn' f lgvct { " lpcng" y cu" cuuguugf " wulpi " y j g" F_{tgecm}" vgej pls wg" cv" Xkuk" 3" y j lej " r ctvlekr cpw" y j gp" wugf " dghqtg" Xkuk" 4" lp" cp" cwgo r v" vq" tgr rlecvg" y j g" uco g" f lgv0' Cpqy j gt" F_{tgecm}" y cu" eqo r ngvgf " qp" Xkuk" 4" lp" qtf gt " vq" ecr wtg" y j g" cewcn' hqqf " lpcng" qp" y j g" r t g x l q w u" f c { " cpf " r ctvlekr cpw" tgegkxgf " lpuwewkpu" qp" j qy " vq" eqo r ngvg" c" f g v c k g f " H_{geqtf} 0' P g z v. " r ctvlekr cpw" eqo r ngvgf " c" H_{geqtf} " y j lej " y cu" r t g u g p v g f " cv" Xkuk" 5" cpf " y g t g" y j gp" i k x g p" y j g" q t k i k p c n' H_{geqtf} " lp" q t f g t " vq" t g r r l e c v g" 46/ j q w t u" d g h q t g" X k u k' 60' C f f k k q p c m { . " c" F_{tgecm}" y cu" e q p f w e v g f " q p" X k u k' 5" l p" q t f g t " vq" g p u w t g" y j g" eqo r n g v g p g u u" q h' y j g" H_{geqtf} " c p f " c i c k p" q p" X k u k' 6" l p" q t f g t " vq" e c r w t g" y j g" c e w c n' h q q f " l p c n g" q p" y j g" r t g x l q w u" f c { 0"

Ncuw { . " u w d l g e w u' y g t g" r t q x k f g f " y k j " c" U_{l g v} " r t g / r c e n c i g f " o g c n u " q h' n p q y p " e q o r q u k k q p" l p" q t f g t " vq" d g" e q p u w o g f " l p" y j g" 46/ j q w t " r t k q t " vq" X k u k u" 7" c p f " 80' V j g" r t g / r c e n c i g f " o g c n u" r t q x k f g f " q p" d q y j " q e e c u k q p u" y g t g" k f g p v l e c n' c p f " r c t v l e k r c p v u r g e k k e. " e q x g t k p i " y j g k t f c k n { " g p g t i { " c p f " p w t l g p v" t g s w k t g o g p u " * T q f t k i w g l " g v' c n' 0' 422; +0' V j g" f l g v' r t q x k f g f " 82" " q h' e c t d q j { f t c v g. " 837" " q h' r t q v g k p. " c p f " 847" " q h' h c v' q h' y j g" v q c n' g p g t i { " l p c n g 0' C " u c o r n g' f l g v" k u' r t q x k f g f " l p" V c d n g" 5080' G c e j " r c t v l e k r c p w u" v q c n' g p g t i { " t g s w k t g o g p v' y c u' e c r e w r c v g f " w u l p i " y j g" J c t t k u" c p f " D g p g f l e v" g s w c v k p p" c p f " y j g" u j q t v' h q t o " q h' y j g" k p v g t p c v k p c n' R j { u l e c n' C e v k x k v { " S w g u k a p p c k t g" vq" f g v g t o k p g" y j g k t " g u k o c v g f " d c u c n' o g v c d q n e" t c v g" c p f " r j { u l e c n' c e v k x k v { " n g x g n" t g u r g e v k x g n { " * J c t t k u" (" D g p g f l e v" 3; 3: = K c s " 4224+0' k p" c" l q k p v' r q u k k q p" u c v g o g p v. " T q f t k i w g l " e t a l. " * 422; + t g r q t v g f < : d g e c w u g" y j g" E w p p k p i j c o " g s w c v k p p" t g s w k t g u" y j c v' n g c p" d q f { " o c u u" d g" n p q y p. " u r q t w u" f l g v k k c p u" v { r k e c m { " w u g" y j g" J c t t k u/ D g p g f l e v" g s w c v k p p 0' R c t v l e k r c p w u" t g w t p g f " c m' n g h q x g t u" q p" X k u k u" 7" c p f " 8" c p f " t g e q t f g f " c p { " c f f k k q p c n' h q q f " g c v g p" u q" y j g" c e w c n' h q q f " e q p u w o g f " e q w r f " d g" f g v g t o k p g f " d { " u w d t c e v k p i " y j g" c o q w p v' q h' h q q f " i k x g p" d { " y j g" c o q w p v' q h' h q q f " n g h' c p f " y j g p" c f f k p i " vq" y j g" v q c n' c p { " c f f k k q p c n' h q q f " q t' f t k p n' t g e q t f g f 0"

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"

Vcdng'5080F kgv'hgf "vq'r ctvlekr cpwu"qp"vj g'f c { 'r tgegf kpi "xkuku"7"cpf '8³"

	Hqkf "	Co qwpv"
O gcn'3"	Eqtphengu" Ugo k'unko o gf "o km'	332'i " 722'o n'
O gcn'4"	Y j kg'dtgcf " Ej ggug" Dgcpu" Dwwgt" Vqo cvq" Ewevo dgt "	565'i " 322'i " 622'i " 62'i " 382'i " 362'i "
O gcn'5"	Rcuc" Vqo cvq"ucweg"	357'i " 397'i "
Upcemu"	Crr ng" Rgcej " Nqy "lqwrg"eqtf kcn'	423'i " 38: 'i " 422'o n'

³Uco r ng'f kgv'ku'hqt" c'97"mi "uwdlgev'tclpkipi "8"f c { u'r gt'y ggn0F kgvct { "eqo r qukkqp<gpgti { "
? "5482"necn=ectdqj { ftcvg"? "6: 3'i =rtqvgkp"? "347'i =hc v"? "5'i 0"
"

"

3.3.3 Nutrient analysis

Kpvtxkgy u'y gtg"eqpf wevgf "d { "c"vclpgf "fkgvlekp"chgt "tgegkxkpi "crr tqrtkcvg"vclpkipi "hqt"
f grkxgtkpi "uweeguuhwi" cpf "rtqhgukqpcn' kpvgtxkgy u0' P wtkleu" uqhy ctg" *P wtkleu" NVF . "
F wdrkp."Kgrcpf +y cu"wugf "vq"cpn { ug"vj g"gpgti { "cpf "o cetqpwtkgpv'kpcngu"htqo "vj g'F_{tgecm}"
cpf "H_{tgeqtf}0C"xgt { "uo cni'pwo dgt"qh'hqkf "kgo u'y gtg"cf f gf "o cpwcm { "vq"vj g'f cvcdcug"wulpi "
vj g'kphqto cvkqp"qp"vj g'pwtkkqp"hcwu'rdgr0'

"

3.3.4 Statistical analyses

Ucwkuecn'cpcn { ugu'y gtg"r gthqto gf "wulpi "URUU"x0; " *KDO "eqtr 0"Cto qpm"P [."WUC+0'
Rqy gt'ecrewvkkp"y cu'pqv'r quukdng"cu"vj ku'y cu"vj g'htuv'uwf { "vq"cuuguu"vj g'tgr tqf weklkxk { "
qh'c" f kgv0Cvklpuqp"cpf "P gxkn"*4223+"rtqxf gf "i wkf cpeg"htq "uwej "uwf kgu"cpf "uwi i guvgf "
vj g'tgetwko gpv'qh'cv'rgcu'42"r ctvlekr cpwu0'Vgp"o qtg"r ctvlekr cpwu"y gtg"tgetwkgf "kp"vj g"
rtgugpv'uwf { "vq"ko r tqxg"rtgekukqp0'Rcktgf /uco r ng"t'vguu"y gtg"wugf "vq"eqo r ctg"vj g'o gcp"
cuuki pgf "gpgti { "cpf "o cetqpwtkgpv'kpcngu"y kj "vj g"cewcn'co qwpv'eqpuwo gf "cu"vj g { "

y gtg"dqj "pqto cm{ "f kmtkdwgf 0'Vj g" f khtgpegu"dgwy ggp"cuiki pgf "cpf "equpuwo gf "gpgti { " cpf " o cetqpwtkgpv" kpcngu" y gtg" pqv" pqto cm{ " f kmtkdwgf 0' Vj gtghqtg." Y kraqzqpau" pqr ctco gtle" vgu" y cu" wugf "vq" eqo r ctg" vj g" o gf kcp" f khtgpegu." y j gtgcu" Mepf cmu" pqr ctco gtle"vcw"B"y cu" wugf "vq" o gcuwtg"vj g"eqttgrvqp0'kp"cf f kkp."vj g"eqghkelpv"qh" xctkvp" *EX"? "322"z" o gcp lUF +" y cu"ecrewcvgf "hqt" gcej " o cetqpwtkgpv" kp"cm"vj tgg" o gvj qf u"cpf "vj g"cxgtci g"EX' "tgr qtvf 0'Vj g"eqghkelpv"qh"tgr gcwdk{ " *ET"? "3Q 8"z" $\sqrt{\sum (d2 - d1)^2 / n - 1}$ " = U"? "uwo = d3"? " o gcuwtgo gpv"3 = d4"? " o gcuwtgo gpv"4 = p"? " uco r ng"uk g+" y cu"cuq"ecrewcvgf "vq" f gvto kpg"vj g" o czko wo "f khtgpeg" rkn{ "vq" qeewt" dgwy ggp" vy q" eqpugewkxg" o gcuwtgo gpv" qh" vj g" uco g" f kvct { " ucpf ctf kcvkp" o gvj qf 0' Qwktgu" y gtg" pqv" gzenf gf "htqo "vj g" f cv" cpcn{ uku"cu" vj g{ "tgr tgugpv" r ctvkr cpw" y j q" hckgf "vq" hmqy "vj g" f kv'tcvj gt"vj cp"gttqtu"kp" f cv0'Vj g" kpenwukp"qh"qwktgu"y kntghnev"vj g" y j qrg"ur gevwo "qh"xctkd{ "kp" f kvct { "kpcng0'Ucvkuecn'uki pkhecpv"y cu'ugv'cv"p > "070"

"

3.4 Results

Vj g" o gcp"gpgti { "cpf " o cetqpwtkgpv" kpcngu"dgwy ggp"vj g"cuiki pgf "cpf "cewcn'co qwpv"qh" hqqf "equpuwo gf " kp" cm" vj tgg" f kvct { " ucpf ctf kcvkp" vej pls wgu" y gtg" pqv" ucvkuecm{ " uki pkhecpv" *Vcdng"504-0'J qy gxgt."vj g" o gf kcp" f khtgpeg"dgwy ggp"cuiki pgf "cpf "equpuwo gf " gpgti { ."ectdqj { ftcv." r tqvklp." cpf "hcv" kpcngu" hqt" F_{tgecm} cpf "H_{geqtf}" y gtg" uki pkhecpv{ " j ki j gt"vj cp"vj qug"kp"vj g"U_{fkgv}"y kj "p"> "023" *Vcdng"505-0'Vj g" qpn{ "ucv kuecm{ "uki pkhecpv" f khtgpeg"dgwy ggp" F_{tgecm} cpf "H_{geqtf}" y cu' hqt' hcv' kpcng0'

"

"

"

"

"

"

"

Vcdrg'50400 gcp'cuuki pgf "cpf "equpuwo gf "gpgti { "cpf "o cetqpwtkgpv'lpvcngu'ht'F_{tgecm}"
H_{geqtf}."cpf "U_{lgv}"

O gj qf "	Cuuki pgf "	UF "	Equpuwo gf "	UF "	p"xcnwg"
F _{tgecm} "	"	"	"	"	"
Gpgti { "necm"	5'269"	873"	5'334"	9: 6"	07: "
Ectdqj { ftcvg"i +"	6220"	3330 "	6330"	35306"	07: "
Rtqvglp"i +"	36708"	7808"	3720 "	7: 05"	046"
Hcv"i +"	32609"	5: 09"	32706"	6307"	0 ; "
H _{geqtf} "	"	"	"	"	"
Gpgti { "necm"	5'348"	884"	5'249"	: 58"	065"
Ectdqj { ftcvg"i +"	5: 707"	35207"	5: 604"	3670 "	0 5"
Rtqvglp"i +"	37409"	6707"	3740 "	8208"	0 : "
Hcv"i +"	33808"	5805"	32709"	6208"	083"
U _{lgv} "	"	"	"	"	"
Gpgti { "necm"	5'253"	6; 2"	5'2: 7"	759"	044"
Ectdqj { ftcvg"i +"	6750 "	9; 02"	67: 08"	: : 08"	069"
Rtqvglp"i +"	3380 "	370 "	33: 08"	3: 0 "	05: "
Hcv"i +"	: 504'"	3906"	: 808"	380 "	02: "

Vcdrg'50500 gf kcp'f hhtgpeg'dgwy ggp'cuuki pgf "cpf "equpuwo gf "pwtkpv'lpvcng'ht'F_{tgecm}"
H_{geqtf}."cpf "U_{lgv}"

P wtkgpv'	F _{tgecm} "	H _{geqtf} "	U _{lgv} "
Gpgti { "necm"ni "DO ^{/3} +"	508, "	50 ^Ä	207"
Ectdqj { ftcvg"i ni "DO ^{/3} +"	209, "	206 ^Ä	202"
Rtqvglp"i ni "DO ^{/3} +"	208, "	208 ^Ä	202"
Hcv"i ni "DO ^{/3} +"	208, ^Æ	206 ^Ä	202"

* p">"023=F_{tgecm}"v.s. "U_{lgv}"

^Äp">"023=H_{geqtf} "v.s. "U_{lgv}"

^Æp">"023=F_{tgecm}"v.s. "H_{geqtf} "

"

Vj g"tguwmu"qh"vj g"eqttgrvklpcn'cpcn'uku"dgwy ggp"cuiki pgf "cpf "eqpuwo gf "pwtlgrp'lpvcngu" hqt"gecj "qh"vj g"vj tgg"o gjy qf u"ctg"uj qy p"lp"Vcdrg"5060Qxgtcm"vj gtg"y cu"c"xgt {"utqpi ." r qukkxg"eqttgrvklp"dgwy ggp"cuiki pgf "cpf "eqpuwo gf "ectdqj {f tcvg"lpvcng" hqt"U_{flgv}"cpf "c" utqpi "eqttgrvklp" hqt" gpgti {"r tqvklp." cpf "hcv" lpvcngu" hqt" U_{flgv}" J qy gxgt." o qf gtcvg" eqttgrvklpu'y gtg'hqwpf "dgwy ggp"cuiki pgf "cpf "eqpuwo gf "gpgti {"cpf "ectdqj {f tcvg"lpvcngu" hqt"F_{tgecm}"cpf "dgwy ggp"cuiki pgf "cpf "eqpuwo gf "gpgti {"r tqvklp."cpf "hcv"lpvcngu" hqt"H_{geqtf}" Vj g"qpn' "utqpi "eqttgrvklpu'hqwpf "hqt"F_{tgecm}"y gtg" hqt"r tqvklp"cpf "hcv"lpvcngu."y j gtgcu" hqt" H_{geqtf}"y cu" hqt"ectdqj {f tcvg"lpvcng"0Cm'eqttgrvklpu'y gtg'ucvklkcm' "uki plklecpv"p">"027-0"

"

Vcdrg"5060Mgpf cm'vw"B"eqttgrvklp"dgwy ggp"cuiki pgf "cpf "eqpuwo gf "pwtlgrp'lpvcng" hqt" F_{tgecm}"H_{geqtf}."cpf "U_{flgv}"

P wtlgrp'	F _{tgecm}	H _{geqtf} "	U _{flgv} "
Gpgti { "	076"	066"	09: "
Ectdqj {f tcvg"	073"	08: "	0 5"
Rtqvklp"	097"	076"	09: "
Hcv"	088"	067"	095"

Cm'xcnwgu'y gtg'ucvklkcm' "uki plklecpv"p">"027"

"

Vj g"EX' "qh"gpgti {"cpf "o cetqpwtlgrpu"qh"U_{flgv}"F_{tgecm}"cpf "H_{geqtf} "ctg"j ki j rki j vgf "lp"Vcdrg" 5070Ucpf ctf kugf "f lgv"j cf "vj g"my guv"EX' "eqo r ctgf "v"vj g"qvj gt"wy q"vej pls wgu" hqt"cm' xctkdrgu'0Eqo r ctgpi "F_{tgecm}"cpf "H_{geqtf}."k'ecp"dg"uggp"vj cv'F_{tgecm}"j cf "my gt"EX' "hqt" gpgti {"r tqvklp."cpf "hcv"y j gtgcu"H_{geqtf}"j cf "my gt"EX' "hqt"ectdqj {f tcvg"0Vj g"j ki j guv" EX' " qdugtxgf" lp" cm' vj tgg" o gjy qf u" y gtg" hqt" hcv' Vj g" tguwmu" qh" eqghlekp' qh" tgr gcvdkrk'." cu" uj qy p" lp" Vcdrg" 507." kpf lcvg" vj cv' vj g"xcnwgu" y gtg" uo cmgt" lp" U_{flgv} eqo r ctgf "v"vj g"qvj gt"wy q"o gjy qf u"0Qp"vj g"qvj gt"j cpf ."vj g"rti guv'xcnwgu'y gtg"uj qy p"lp" H_{geqtf}" hqt"cm'xctkdrgu'gzegr v'ectdqj {f tcvg"0

"

"

"

"

Vcdrg'5070Tgnkdkrk\ "qh'gpgti { "cpf "o cetqpwtkgpv'kpcngu'hqt'F_{tgecm}"H_{geqtf}."cpf "U_{fkgv}"

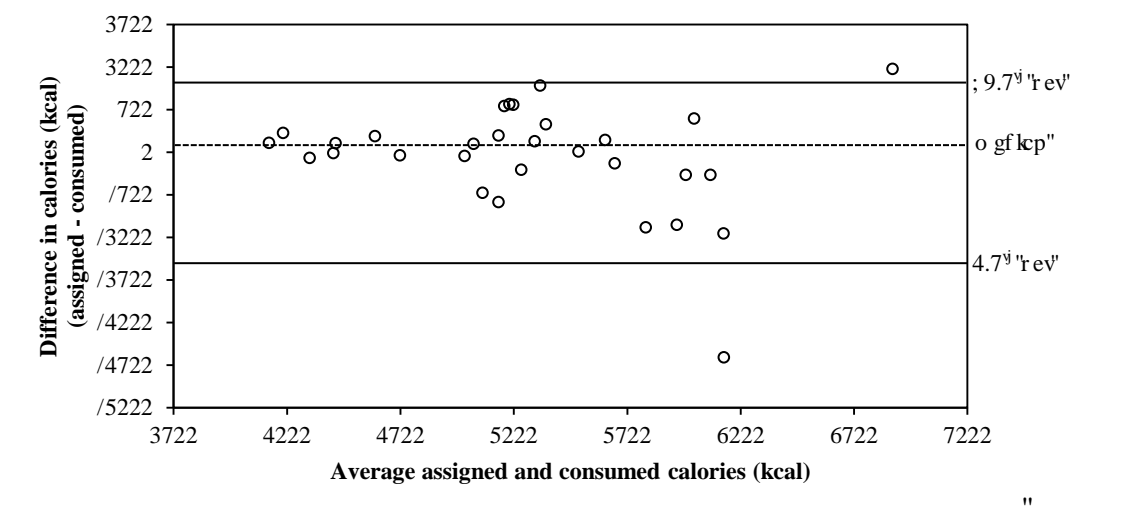
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D_{recall}	"	"	"	"
EX' "	; ' "	33' "	9' "	34' "
ET"	3"47: "	4250"	6: "	7906"
F_{record}	"	"	"	"
EX' "	33' "	32' "	33' "	3; ' "
ET	3"578"	37; Q "	97Q "	9205"
S_{diet}	"	"	"	"
EX' "	5' "	5' "	5' "	8' "
ET"	6: 2"	8605"	4405"	42Q "

"

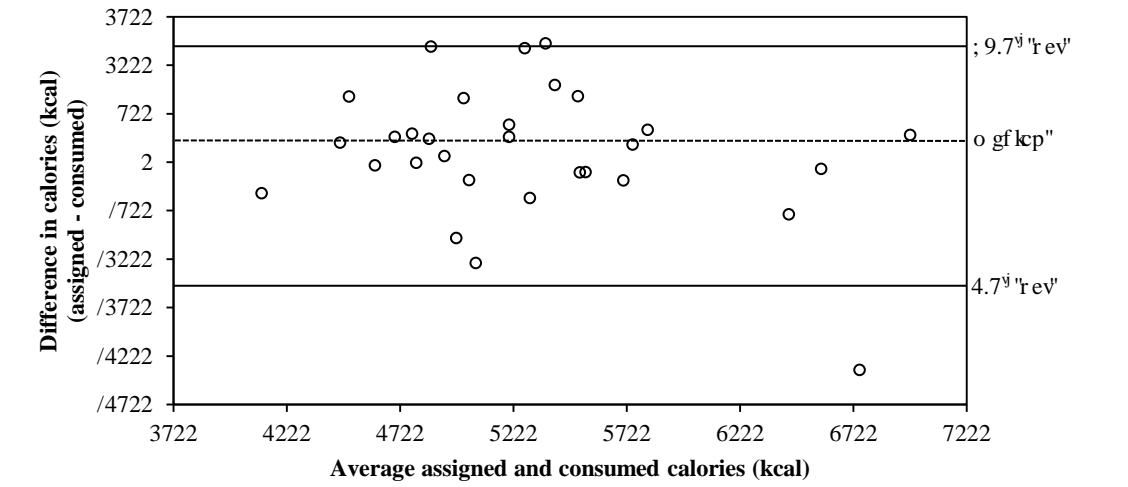
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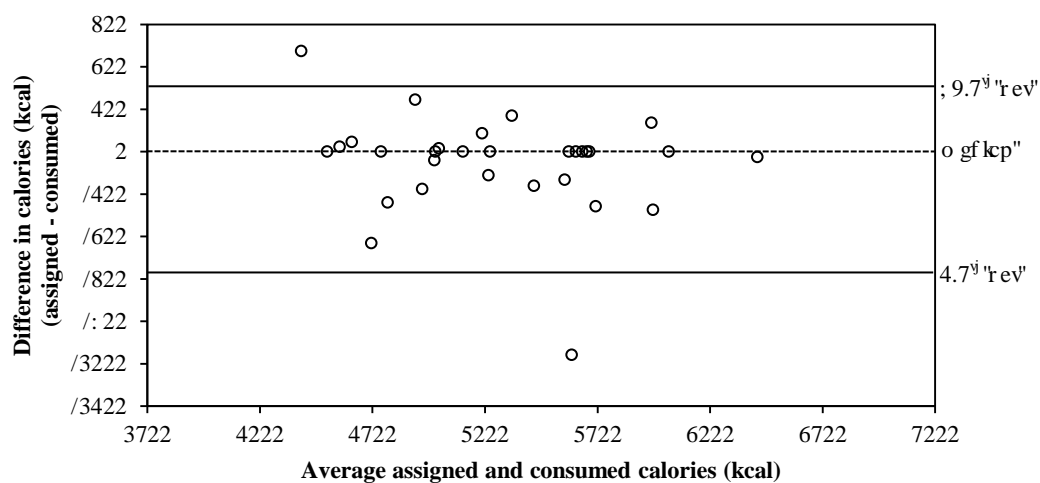
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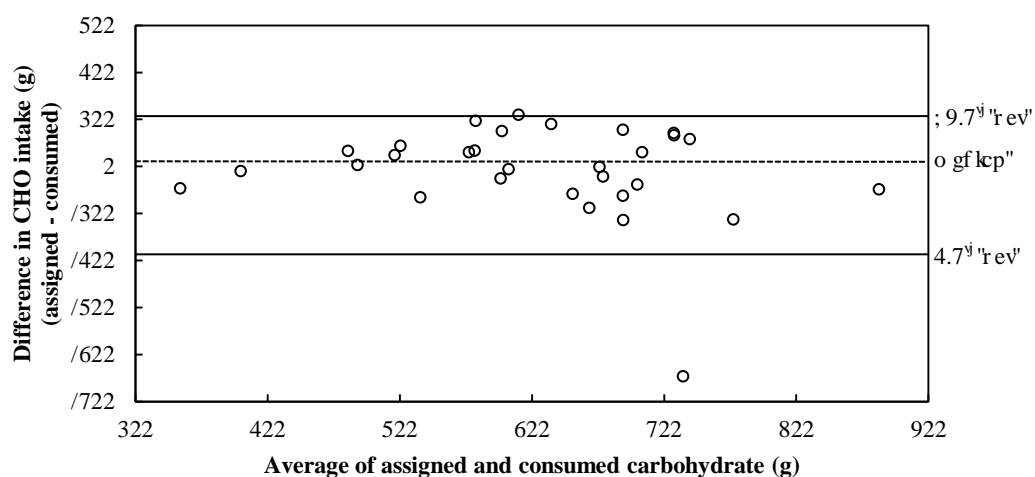
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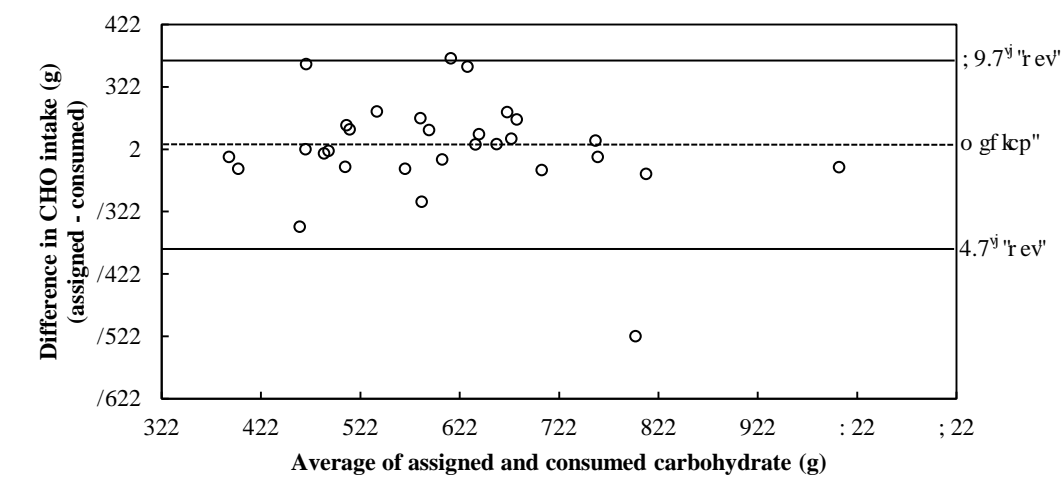
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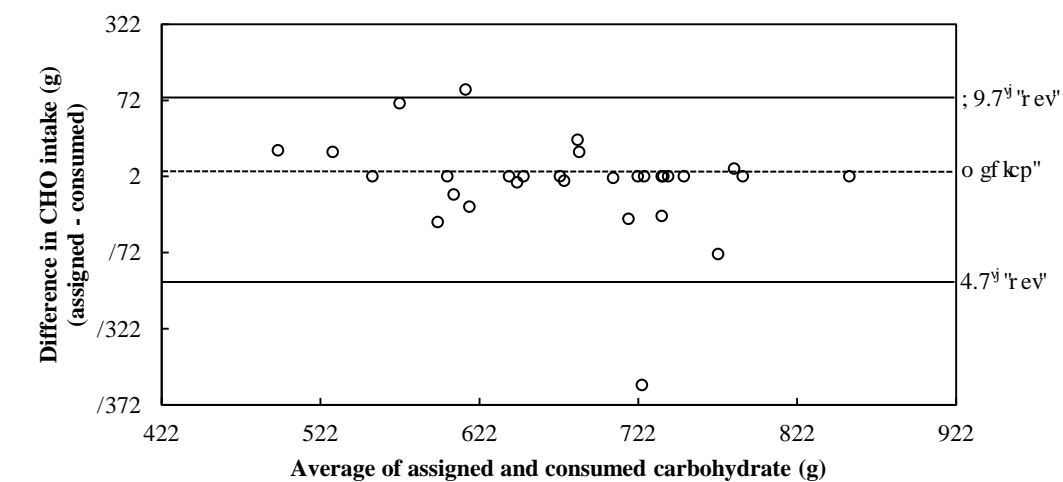
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Hi wtg"5070Eqo rctkqp"qh"vj g"co qwpv"qh"ectdqj { ftcvg"i "tgr qtvgf"qp"vj g"ktuv"cpf " ugeqpf "xkukv'hqt"F_{tgecm}0

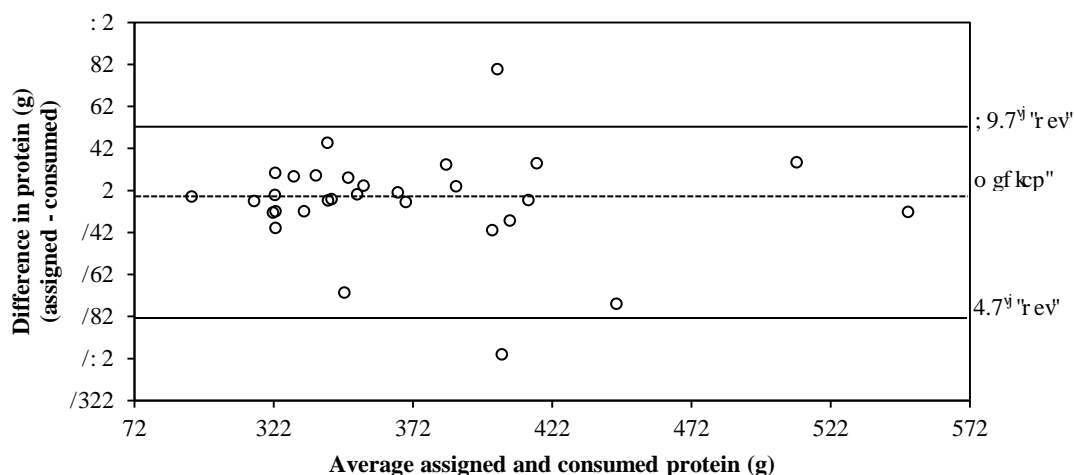


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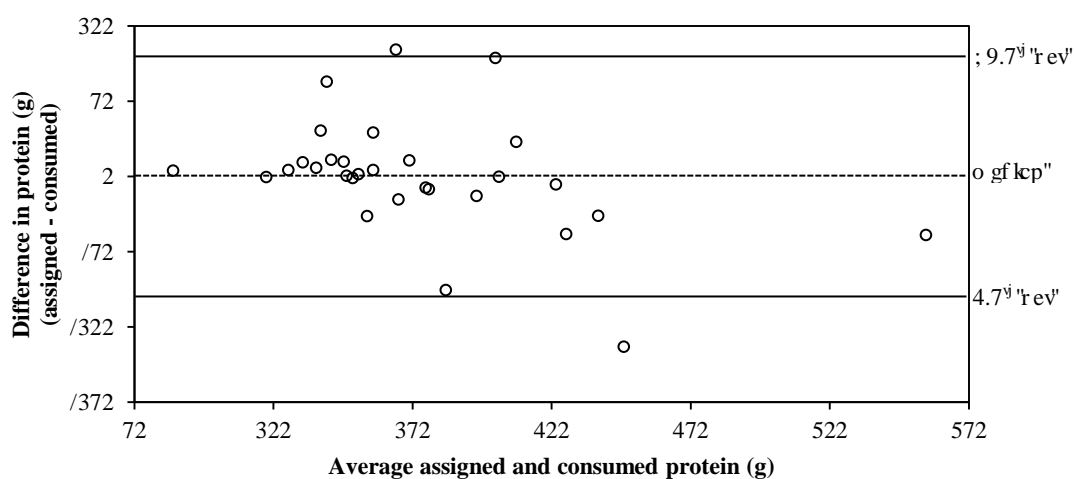


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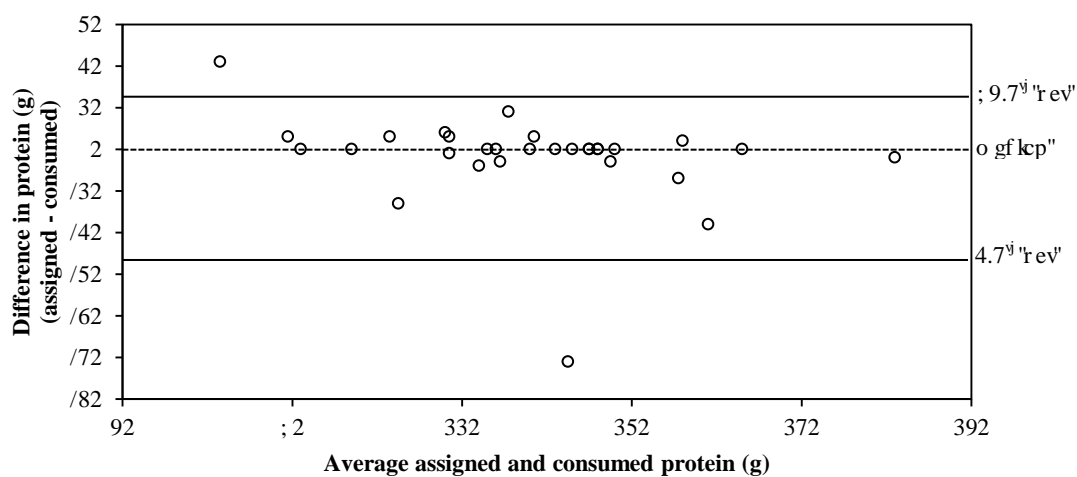
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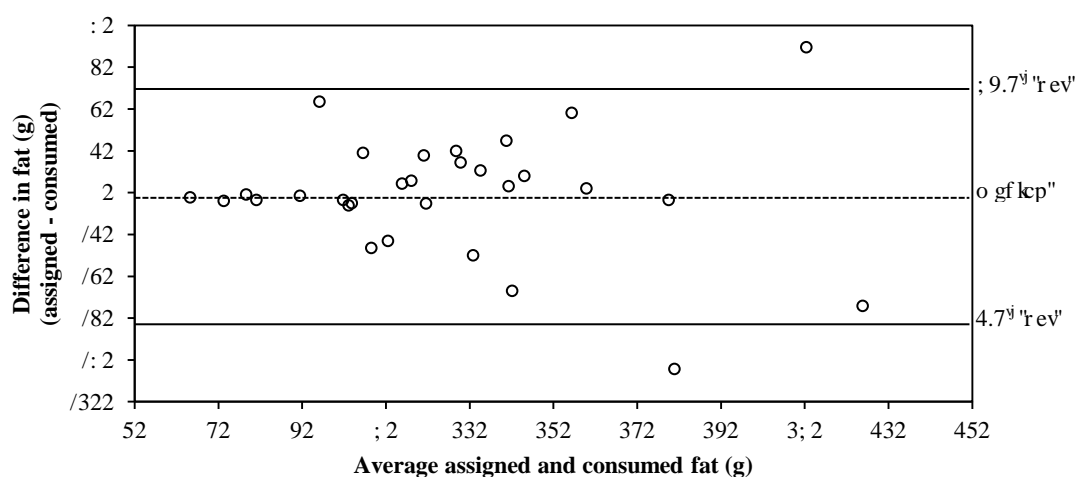
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hqt"F_{tgecm}0



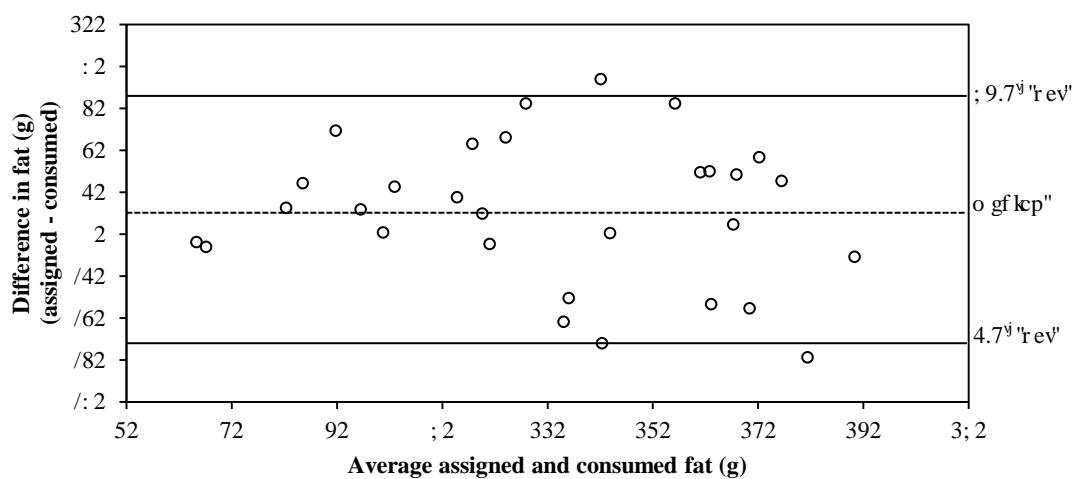
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hqt"H_{geqtf}0



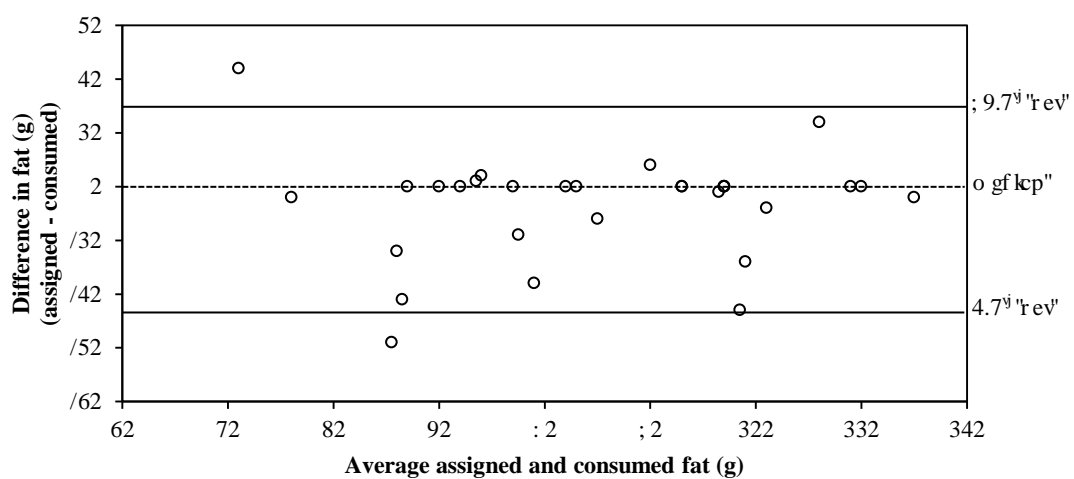
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Hi wtg"5030Ego r ctkuqp"qh'yj g"co qwpv'qh'rcv"i +tgr qtvgf"qp'yj g'htuv'cpf"ugeqpf" xkuk'hqt" F_{tgecm}0



H₀: $\mu = 0$ vs $H_1: \mu \neq 0$ (Two-tailed test)
 Test statistic: $t = \frac{\bar{d} - 0}{s_d / \sqrt{n}} = \frac{0.5}{1.5 / \sqrt{10}} = 1.05$
 Critical value: $t_{\alpha/2, n-1} = t_{0.025, 9} = 2.262$
 Decision: $|t| < t_{\alpha/2, n-1}$, fail to reject H_0 .
 Conclusion: There is not enough evidence to suggest that the average difference in fat (g) (assigned - consumed) is not zero.



H₀: $\mu = 0$ vs $H_1: \mu \neq 0$ (Two-tailed test)
 Test statistic: $t = \frac{\bar{d} - 0}{s_d / \sqrt{n}} = \frac{0.5}{1.5 / \sqrt{10}} = 1.05$
 Critical value: $t_{\alpha/2, n-1} = t_{0.025, 9} = 2.262$
 Decision: $|t| < t_{\alpha/2, n-1}$, fail to reject H_0 .
 Conclusion: There is not enough evidence to suggest that the average difference in fat (g) (assigned - consumed) is not zero.

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3.5 Discussion

Vj g"o gf kcp" f khtgpeg" dgwy ggp" cuuki pgf" cpf" eqpuwo gf" pwtkpv" kpcngu" hqt" F_{tgecm} cpf" H_{geqtf} "y gtg" uki phtecpv" { "j k j gt" yj cp" kp" yj g" U_{fkgv} "Vq" r w" k" kpq" eqpvz.v. "yj g" f khtgpeg" dgwy ggp" xkuku" 3" cpf" 4" qh" F_{tgecm} "kp" ectdqj { ftcvg" kpcng" qh" c" r ctvek cpv" y gli j kpi "97" mi " y cu" ctqwpf "72" i "y j gtgcu" yj g" f khtgpeg" y cu" 52" i "hqt" H_{geqtf} "cpf" 2" i "hqt" U_{fkgv} "Jy gxgt. "pq" y gm/f guki pgf" uwf { "j cu" gxgt" kpxguki cvgf" c" f khtgpeg" kp" ectdqj { ftcvg" kp" uwej "ngxgu" qp" r j { ulecn" r gthqto cpeg" uwej " cu" vko g" vq" gzj cwukqp0' Vj g" o gf kcp" f khtgpeg" dgwy ggp" cuuki pgf" cpf" eqpuwo gf" pwtkpv" kpcng" kp" F_{tgecm} "cpf" H_{geqtf} "y cu" pqv" ucvkulecn { "uki phtecpv" *gzevr v' hqt' hcv' kpcng+ "cpf" yj gtg" ctg" y q' r quukdn' gZR mpcv' kpu' hqt' yj ku0"

Vj g"o ckp" gttqt" ecwukpi "yj g" dki i guv' xctkvp" kp" hqqf" kpcng" kp" yj gug" vy q" vej pls wgu" y cu" yj g" f khtewm { "v" cf j gtg" vq" yj g" f kgv" d { "r ctvek cpv0' kp" o quv' tgugetej "uwf kgu. "r ctvek cpv" ctg" hgg" r kxkpi "y j lej "o cngu" k' f khtewm' hqt" gZR gto gpvgtu" vq" eqpvtn' gxgt { "ukpi ng" cur gev' qh" yj gk" r ctvek cpv" f ckn { "rkguv" ng0' O cp { "qh" yj gug" cur gev. "uwej " cu" dwu { "uej gf wgu. " yj g" cxckcdkxk { "qh" cm' hqqf" kpvpgf gf "vq" eqpuwo g. "o qqf " *f gqo cpu" ("Eqwi j ncp" 422; + "cpf" f c { / vq/ f c { "xctkvp" kp" cr r gvkxg" *Tcdgp" gv' cn0' 3; ; 7+ "o c { "ngcf" r ctvek cpv" vq" wpf gt/ "qt" qxgt/ gc0' Vj ku" gttqt" chgew' dqvj "vej pls wgu" cv' yj g' uco g' ngxgn' y j lej "ngcf u' vq" c' uko kct "xctkvp0' Vj g' ugeqpf "v' r g' qh' gttqt" j cu" uo cmgt "ghgev" qp" yj g' xctkvp" kp" pwtkpv" kpcng= j qy gxgt. "kv" hqto u" cp" ko r qvcpv' eqo r qpgpv' qh' yj g' uo cmf' khtgpegu" qdugt xgf "kp" EX' " dgwy ggp" F_{tgecm} cpf" H_{geqtf} "0' Vj ku" gttqt" ku" cuqekcvgf" y kj " yj g" vej pls wgu0' qy p" r tqr gt vku0' Y j kng" qpg" vej pls wg" tgs wktgu" hmqy kpi "c" H_{geqtf} "y tkwgp" d { "yj g" r ctvek cpv" j ko ugn' wukpi "j ku" qy p" o gcuwtkpi "vqnu" *Drcen' 4223+ "yj g" qvj gt" * F_{tgecm} "tgs wktgu" hmqy kpi "c" rku' qh' hqqf "y tkwgp" d { "yj g' kpxguki cvqt" f wtkpi "yj g' kpvgtxgy "wukpi "yj g' kpxguki cvqt0' o gcuwtkpi "vej pls wg0'

Vj g' tguwu" qh' yj g' EX' "uwi i guv' yj cv' U_{fkgv} "ku" c" dgwgt" cr r tqcej "vq" ucpf ctf kug' f kgvct { "kpcng" yj cp" F_{tgecm} "cpf" H_{geqtf} . "ngcf kpi "vq" uo cmgt "xctkvp" kp" gpgti { "cpf" o cetqpwtkpv" kpcngu0' Vj g' tci g' qh' EX' "hqt" cm' xctkdngu" y cu" dgwy ggp" 5/8' "hqt" U_{fkgv} "32/3; ' "hqt" H_{geqtf} . "cpf" 9/ 34' "hqt" F_{tgecm} "0' Y kf g' xctkvp" kp" gpgti { "cpf" o cetqpwtkpv" kpcngu" dgwy ggp" r ctvek cpv" *kpvgt/ uwdlgev' xctcdkxk { + "y g" cmq" qdugt xgf = j qy gxgt. " yj ku" y cu" gZR gev' f vq" yj g" cxckcdkxk { "qh" f khtgpv' v' r g' qh' cvj ngvu" y j q" j cxg" f khtgpv' pwtkpv" tgs wktgo gpv0' kp" r tceveg. " yj ku" xctkvp" eqwrf " j cxg" c" pgi cvkxg" ko r cev' qp" yj g' ucpf ctf " f gxkvp" cpf" yj gtghqtg" qp" yj g' ucvkulecn' uki phtecpeg" qh' uwf kgu0' Vj g" o czko wo " f khtgpeg" rkngn { "vq" qeewt" dgwy ggp" y q" eqpugewkxg" xkuku" hqt" cm' f kgvct { "xctkdngu" y cu" uo cmgt" kp" U_{fkgv} eqo r ctgf " vq" yj g" qvj gt" y q" o gvj qf u0' Vj gug" tgnkcdkxk { " f cvc" r tqxkf g" tgugetej gtu" y kj "

i wkf cpeg"qp"vj g"o quv'uwkcdng"f lgvct { "ucpf ctf kucvqp"vgej pls wg"ht"vj gk"tgugctej "r tqlgev"
vj cv'y kmj cxg"vj g"o kpk cni ko r cev'qp"vj gk"tguwmu0'

Vj g"tguwmu"qdvclpgf "uj qy gf "pq"fhhtgpegu"kp"o gcp"gpgti { "cpf"o cetqpwtkgpv"kpvcngu"
dgwy ggp"xluku"ht"cp { "o gvy qf 0'Vj gug"tguwmu"ctg"eqpukngpv'y kj "vj g"o clqtkv { "qh'uwwf lgu"
y kj "etquuxgt"f guki p"cpf "uwi i guv"i qqf "r ctvlekr cpv"tgr tqf wekdtkv { "Dqpf "gv'cr0'4234=
O cef gto kf "gv'cr0'4234+0'Cu"tgxgcrgf "kp"vj g"tgxlgv "r tgugpvgf "kp"Ej cr vgt "4"*ugg"ugevqp"
407+"ø87' "qh'uwwf lgu"r wdrkuj gf "kp"KUP GO "cpf "LKUP "gkj gt"f q"pqv"ej gem'uwdlgevau"
eqo r nkpeg"v"vj g"fgv'i kxgp"qt"f q"pqv'o gpvqp"K0'K'ku'r quukdng"vj gtghqtg"vj cv'qwrkgtu"cpf "
r ctvlekr cpw'y kj "r qqt"eqo r nkpeg"ctg'o cungf "d { "vj g"o gcp"xcnwgu0"

Qwrkgtu"y gtg"kf gpvklgf "kp"cm"vj tgg"f lgvct { "ucpf ctf kucvqp"vgej pls wgu0'J qy gxgt."hgy gt"
qwrkgtu"y gtg"qdugt xgf "kp"U_{fgv}"eqo r ctgf "vq"F_{tgecm}"cpf "H_{geqtf}0'Vj g"qwrkgtu"kp"F_{tgecm}"cpf "
H_{geqtf}"j cf "dki i gt"f kuetgr cpeku"kp"gpgti { "cpf"o cetqpwtkgpv"kpvcngu"eqo r ctgf "vq"U_{fgv}0'Hqt"
gzco r rg."vj g"fgv"i kxgp"qt"f q"pqv'o gpvqp"K0'K'ku'r quukdng"vj gtghqtg"vj cv'qwrkgtu"cpf "
dki i gt"vj cp"vj g"qwrkgtu"kp"U_{fgv}0'K"ppg"r ctvlekr cpv"vj g"fhhtgpegu"kp"ectdqj { ftcvg"kpvcng"
dgwy ggp"xluku"fhhtgf "d { "522"i "y j gp"H_{geqtf}"y cu"wgf 0'K'ku'o qtg"rkngr { "vj cv"vj ku"y cu"
ecwuf "d { "qxgt/gcvpi "tcvj gt"vj cp"qxgt/tgr qtvpki 0'Vj ku"fhhtgpegu"kp"ectdqj { ftcvg"kpvcng"
eqwf "j cxg"cp"ko r qtcvpv"r tcevekn"ko r dekvqp"qp"o cp { "f gr gpf gpv"xctkcdngu"lpenwf lpi "
gpf wtcepg"r gthqto cpeg0C"uki pkhecpvf fhhtgpegu"kp"ectdqj { ftcvg"kpvcng"j ki j "ø: "i 0ni^{/3}vs."
mgy "ø3"i 0ni^{/3} ectdqj { ftcvg"fgv"ht"vj tgg"fc { u"ecp"ngcf "vq"cp"ko r tqxgo gpv"kp"
r gthqto cpeg"kp"vj g"j ki j "ectdqj { ftcvg"fgv"i tqwr"eqo r ctgf "vq"vj g"mgy "ectdqj { ftcvg"i tqwr "
*Dkuj qr "gv'cr0'4223c=Dkuj qr "gv'cr0'4223e+0'Qxgtem"r ctvlekr cpw'wulpi "F_{tgecm}"cpf "H_{geqtf}"j cf "
r qqtgt"eqo r nkpeg"cu"ecp"dg"uggp"htqo "vj g"uecwgtgf "qdugtxcvapu"kp"vj g"hi wtu"eqo r ctgf "
vq"U_{fgv}0'

Vj g"gxkf gpeg"htqo "vj ku"uwf { "uwi i guw"vj cv'f lgvct { "xctkcdtkv { "kp"uwdlgev"r tgr ctvlekr "ku"cp"
ko r qtcvpv'uqwtg"qh"gttqt"cpf "ecp"dg"o kpk k gf "d { "wulpi "U_{fgv}"cu"cp"ghgevxg"vgej pls wg"vq"
ucpf ctf kug"fgvct { "kpvcng"fwlpi "vj g"r tg/vtkn"r tgr ctvlekr "r gtlqf 0'K'f qgu"pqv"qp { "gputg"
eqo r nkpeg"cpf "tgf weg" xctkcdtkv { "dw"kv"cnq"o cnqu"kv"gcukgt"vq"ej gem'eqo r nkpeg"d { "
gkj gt"wulpi "c"ej gemku"qt"d { "cunlpi "r ctvlekr cpw"vq"tgwtp"cp { "nghqxgtu0'Vj ku"vgej pls wg"
cnq"j cu"hy gt"dwtf gpu"qp"r ctvlekr cpw"cpf "f qgu"pqv"tgs wltg"r ctvlekr cpw"vq"j cxg"cp { "
pwtklqpcn"mpqy ngf i g"vq"r ncp"vj gk"fgv0'J qy gxgt."kv"etgcvgu"uqo g"dwtf gpu"qp"vj g"
gzr gto gpvt"cu"vj g"r tgr ctvlekr "qh"vj g"r tg/r cenai gf "o gcu"ku"ko g"equwo lpi "cpf "equw { "
eqo r ctgf "vq"F_{tgecm}qt"H_{geqtf}"*lgceqeng"("Dwtng"4232+0'

Hkpcmf . "c"pwo dgt "qh'ko r qtwcpv'ko kcvkqpu"pggf "v"dg"eqpukf gtgf O'Rctvlekr cpvu'y gtg"cy ctg" qh'yj g"clo "qh'yj g"uwf { "y j lej "gpj cpegf "y g"rkngkj qqf "qh'dgwgt "cf j gtgpeg"v"y j g"fkv'cpf " r qvgpvkcmf "mqy gt "y j g"xctkcdkxk" qh'pwtlcpv'lpvcnguO'Hqt "y ku'tgcuqp. "y g'tguwmu"qdvckpgf "kp" yj ku'uwf { "o c { "wvf gtguko cvg"y j g"vvg"xctkcdkxk" "y cv'eqwrf "dg"qdugt xgf "kp"qy j gt "uwf lgu" y j gtg"fkvct { "ucpf ctf kcvkqp"ku"pqv'y j g'htuv'clo O'Vj g"qtf gt "qh'yj g"fkvct { "vgej pls wgu'wugf " y cu"pqv'tcpf qo kugf "ngcf kpi "v" c "r qvgpvkcn'ko r tqxgo gpv"kp" r ctvlekr cpvu'tgecmkpi "unkmu" fwtkpi " y j g" F_{tgecm} kpvgtxkgy uO' Vj g" tcpf qo kcvkqp" y cu" pqv" r quukdrng" cu" kv" y qwrf " j cxg" eqo r rdecvdf "y j g"fkv p"qh'yj g"uwf { "d { "kpetgculpi "y j g"pwo dgt "qh'xkuku"y j gp"H_{geqtf} ku'wugf " htuv" *ugxgp" xkuku" qt "U_{fkv} htuv" *gk j v" xkuku" eqo r ctgf "v" ulz " xkuku" cu" kp" y j g" ewtgpv" r tqvqeqrO'Y g"cmu"fkf "pqv'o gcuwtg"r ctvlekr cpvu'gpgti { "gZR gpf kwtg"qp"y j g"fk { "r tgegf kpi " gcej "xkuk'v"ugg"y j g y j gt "y j g"xctkcdkxk"kp"pwtlcpv'lpvcngu"y cu"eqttgrvdf "y kj "y j gk"cevkxk" " ngxgrO'J qy gxgt. "y j g"fkf "cun'qwt"r ctvlekr cpvu"v"nggr "y j gk"r j { ulecn'cevkxk" "hxgr'cu'emqg"cu" r quukdrng"y j g"fk { "dghqtg"gecj "xkukO"

3.6 Conclusion

Vj ku'uwf { "eqphko u"y j cv'o cng"cyj ngvu"xct { "y j gk"fkvct { "kpcng"y j gp"y j g { "ctg"cumgf "v" tgr tqf weg" y j gk" hggngf " ugrgevgf " fkv'kp" eqo r ctuqp" v" y j gp" o gcu"ctg" r tqxkf gf "cu" c" ucpcf ctf kugf " fkvO' Vj gtghqtg. "ucpcf ctf kugf " fkv'uj qwrf " dg" wugf " y j gp" fkv" j cu" c" i tgc v' kphwgepg"qp"y j g"kpvtxgpvqp"qt"r gthqto cpeg"cpf "cp"gpj cpegf "tgrkcdkxk" "ku'tgs wktgf "f wg" v"y j g"uo cm'gZR gevdf "ghgeO' Vj ku'tgugctej "j cu" j ki j rki j vgf "o cp { "s wgvkqpu"kp"pggf "qh" hwtj gt "kpxguki cvkqpO'O qtg"tuguctej "ku"pggf gf "vcti gvki "qy j gt"r qr wcvkqp"i tqwru. "uwej "cu" wvckpvgf. "qxgty gli j v"cpf "qdgug"r gqr ng. "cpf "hgo cng"cyj ngvuO'Hwtj gt "y qtnlpggf u"v"dg" f qpg"v"guvdrkuj "v"y j cv'gzvvpv'f gr gpv'xctkcdngu" *kqO'r gthqto cpeg. "dmqf "dkqo ctngtu. " cpf "pwtlcpv'qz kf cvkqp"ctg"chgevgf "d { "o cplr wcvkqp"qh'fkvct { "r ctco gvgtu" *gd O'vqcn'f ckn" ectdqj { ftcvg'kpcng"y j kj kp"y j g"v { r lecn'cpi g"qh'xctkcdkxk"qdugt xgf "kp"y j ku'uwf { O' "

Chapter 4

The consumption of liquid diet pre-experimental trials improves adherence compared to solid diet in athletes

4.1 Summary

F kuetgr cpekgu"kp"gpgti { "cpf "o cetqpwtkgpv"kpvcngu"ctg"cr r ctgpv"kp"tgugctej "uwf kgu"gxgp" y j gp" c" uqrkf" r tg/r cenci gf "f kgv" *UQf kgv" ku" wugf " vq" ucpf ctf kug" f kgvct { " kpvcngu0 K" ku" wpnpqy p"y j gyj gt "c" nks wkf "r tg/r cenci gf "f kgv" *NKf kgv" r gcf u" vq" ko r tqxgf "cf j gtgpeg"cpf " vj gtghqtg" rny gt "xctkcdkrf { "kp"gpgti { "cpf "o cetqpwtkgpv"kpvcngu0 Vj g" cko "qh"vj ku"ugeqpf " uwf { "y cu"vq"cuuguu"vj g"cdkrf { "qh"cyj ngvu"vq"tgr rdecvg" c" f kgv"y j gp "NKf kgv"cpf "UQf kgv"y gtg" wugf " cu" f kgvct { " ucpf ctf kucvkqp" vgej pls wgu0 Kp" c" etquuxgt" f guki p. " r ctvlekr cpwu" y gtg" tcpf qo n { " cuuki pgf " vq" gkj gt "UQf kgv" qt "NKf kgv" gcej " eqpuwo gf " qp" vy q" ugr ctcvg" f c { u0 Rctvlekr cpwu"y gtg"kpwtwvfg "vq"eqpuwo g"cm"vj g"o gcu"r tqxkf gf "cpf "vq"tgwtp"vj g"rghqxtgu0 Vy gpv { /gki j v'o cng"cyj ngvu"eqo r ngvgf "vj g"uwf { 0Vj g"cpn { ugu"qh"vj g"uecwgt "r rqu"uj qy gf " vj cv"vj g"qdugtxcvkqp"kp"UQf kgv"cpf "NKf kgv"y gtg" f kmtkdwgf "ctqwpf " vj g"o gcp"y kj "vj g" gzeqr vkqp"qh"uqo g"qwrktgu0 Vj g"EX" "qh"gpgti { "cpf "o cetqpwtkgpw" hqt "UQf kgv"y gtg" j ki j gt"vj cp "NKf kgv"*7" "cpf "5" "hqt"gpgti { =7" "cpf "5" "hqt"ectdqj { f tcvg=7" "cpf "4" "hqt" r tqvklp=cpf "7" "cpf "5" "hqt"hc v."tgur gevkg n { +0Gpgti { "cpf "o cetqpwtkgpv"kpvcngu"qp" f c { "3" y gtg"xgt { "utqpi n { . "r qukkxgn { "eqttgrvfg "t" @0 2+"y kj "vj qug"qp" f c { "4" hqt"dqj "o gyj qf u"p >"02+0 Vj ku"uwf { "eqphto u"vj cv"NKf kgv"ku"cp"ghgevg"vgej pls wg"vq"ucpf ctf kug" f kgv"r tg/ gztgkto gpvni"tkni"cpf "eqwf "dg"wugf "cu"cp"cngtpcvkg"vq"UQf kgv0

"

4.2 Introduction

Cu"eqpenf gf "kp"vj g"r tgxkqu"uwf { "r tgugpvfg "kp"Ej cr vgt"5. "Uf kgv"ku"vj g"dguv"cr r tqcej "vq" eqpvtqn" f kgvct { "kpvcng"cpf "o wuv"dg"eqpuf gtgf "y j gp" f kgv"j cu" c" i tgc v" kphwgepg"qp" vj g" kpvtxgpkqp" qt "r gthqto cpeg"cpf "cp" gpj cpegf "tgrkcdkrf { "ku" tgs vkt gf " f wg" vq" vj g"uo cm" gztggevfg "ghge v0 Vj ku"eqpenwukqp"ku"cnq"uwr r qtvgf "d { "Lgceqeng"cpf "Dwtng"*4232+"y j q" uj qy gf " uko krt" qdugtxcvkpu0 J qy gxgt. " f gur kg" ku" uwr gtktkv { " qxgt" vj g" qvj gt" f kgvct { " ucpf ctf kucvkqp"o gyj qf u."k"j cu"qp n { "dggp"wugf "d { "9" "qh"uwf kgu"r vdrkuj gf "kp"KLUP GO "cpf " LKUP "htqo "422: "vq"4236"*ugg"ugevkqp"406+0Vj g"vpr qr wrtkv { "qh"vj g"UQf kgv"ku"xgt { "rkngn { " f wg"vq"vj g"j ki j "equv"cpf "dwtf gp"qp"tgugctej gtu0Ceeqtf kpi "vq" Lgceqeng"cpf "Dwtng"*4232+." vj g"cxgtci g"equv"r gt"r ctvlekr cpv"r gt"tkni"ku"dgvy ggp"9042"cpf "G; 0820Vj ku"lpetgcugu"vj g" dwf i gv"qh" c"uwf { "uki phtecp n { . "gur gekcm { "y j gp" c" dki "uco r ng"uk g"cpf lqt "o wnr ng"tkni" ctg"tgs vkt gf 0Kp"cf f kkp. "vj g"r tgr ctcvkqp"qh"vj g"UQf kgv"ku"vko g"eqpuwo kpi "y kj "cp"cxgtci g"

ko g'ur gpv'r gt'r ctvlekr cpv'dgy ggp"407/5047"j qwtu"lpenwf lpi "f gxgmqr lpi "vj g'f lgv"i tqegt { "uj qr r lpi . "hqf "y gki j lpi "cpf "r cenri lpi "Igcceqeng"("Dwtng"4232+0"

Vj gtghqtg."lp"cp"cwgo r v"vq"ko r tqxg"vj g"eqo r ncpeg"vq"vj g'f lgv"i kxgp"gxgp"lwtvj gt"cpf "vq"tgf weg"vj g"equv"cpf "ko g'qh'r tgr ctvlekrp."y g'r tqr qug"v"pgy "o gyj qf "vq"ucpf ctf kug"v"lqvct { "lpcvng"v wtkpi "vj g'r gtlqf "dghqtg"gzr gtko gpvcl'tlcn0Vj ku"o gyj qf "ku"ej ctcevgtkugf "d { "vj g"r tqxkukqp" qh" c" NK lgv" kpugcf " qh" UQf lgv0 Y g" dgrkxg" vj cv" NK lgv" y kni tgs wktg" ngu"r tgr ctvlekrp"ko g"cpf "ghqt0T gugctej gtu'y kni qpn { "pggf "vq"o kz "f khtgtpv'r tqf weu"vqi gyj gt" *g0 0"o gcn'tgr mego gpv" r qy f gt" cpf " o km0 NK lgv" ecp" dg" ej gcr gt" cu" y gm" cpf " o quv"ko r qtvcpv { "y kni"o cng"v"gcukgt"ht"r ctvlekr cpv"vq"equwo g0Vj g"ck0 "qh"vj ku"uwf { "y cu"vj gtghqtg"vq"cuugu"vj g"cdkx { "qh"vj ngvu"vq"tgr decv"v"v"lqv'y j gp"v"NK lgv"cpf "UQf lgv'y gtg" wugf "cu"v"lqvct { "ucpf ctf kucvlekrp"vgej pls wgu0

4.3 Materials and methods

4.3.1 Participants

Vj kv{/vy q" o qf gtcvgn{/ " cpf " y gm'vclpvgf " o cng" vj ngvu" r ctvlekr cvgf " lp" vj ku" uwf {0 Rctvlekr cpv'y gtg"tgetvkvf "htqo "ur qtu'enwdu"lp"Qzhqtf uj ktg"d { "eqpvceklpi "vj gkt'tgur gevkg"eqcej gu0Gri kdkx { "etkgtlc"lpenwf gf <"

- Cvj ngvu"ci gf "dgy ggp"3: /67" { gctu"
- Kpxqrxgf "lp"v"vgo "qt"gpv wlcpeg"v { r g"cevkxkv { "
- Vtclpklpi "x"7"j qwtu'r gt'y ggm"
- Pqv'cmgti ke"qt"lpvqngtcpv"vq"hqf "r tqxkf gf "
- Htgg"qh'o gvcdrke"v kqtf gtu"*g0 0f kcdgyu."ectf kqxcuewrt"v kugcug."qt"j { r gtvgpukqp+"

Vj ku"uwf { "y cu"eqpf wevgf "ceeqtflpi "vq"vj g"i vlf grkpgu"vcl"v"qy p"lp"vj g"F gerctvlekrp"qh"J gnukpnk"cpf "cm"r tqegf wtu"lpxqrxklpi "j wo cp"uwlgeu"y gtg"cr r tqxgf "d { "vj g"Wpkxgtukv { "Tgugctej "cpf "Gy leu"Ego o kvgg"*WTGE+"cv"Qzhqtf "Dtqqngu"Wpkxgtukv { "*Cr r gpv kz "D+0 Y tkwgp"lphqto gf "eqpugpv'y cu"qdvclpvgf "htqo "cm"r ctvlekr cpv"r tkqt"vq"vj gkt"r ctvlekr cvlekrp"lp"vj g"uwf {0

"

4.3.2 Experimental Design

Rctvlekr cpw"eqo r ngvfg "hkg"xkuku"vq"y g"ndqtcvqt {"cv'Qzhqtf "Dtqqngu"Wpkygtukv\ "y kj "cv" ngcu"qpg"fc {"dgwy ggp" gcej "xkuk0'Qp"xkuk"3."r ctvlekr cpw"y gtg"y gki j gf "vq"20"ni "pgct" r tgeklukp"kp"rki j v'enqy kpi "cpf "dctghqv" wukpi "c"ecrldtcvgf "grgevtqple"uecrg"*Vcpkc"WM" Nf0"l kgy ung{."O kf f nguz."WMH0J gki j v'y cu'o gcuwtgf "y kj qw'uj qgu'y kj "cp"ceewtce {"qh" 20"eo "wukpi "c"ucf kqo gvgf *Ugec"Nf0'Dkto kpi j co ."WMH0Chgt "vckpi "y g"cpvj tqr qo gtle" o gcuwtgo gpw."r ctvlekr cpw"y gtg"tcpf qo n\ "cuuki pgf "vq"qpg"qh'y g"hmny kpi "eqpf kkpq"3+" uqkf "r tg/r cenci gf "f kgv" cpf "4+" rks wkf "r tg/r cenci gf "f kgv' Vj gtghqtg."r ctvlekr cpw"y gtg" gkj gt" i kxgp"UQf kgv"qp"Xkuku"3"cpf "4"cpf "Nkf kgv"qp"Xkuku"5"cpf "6"qt" *vice versa*0' Rctvlekr cpw" y gtg" cmqecvgf " wukpi " c" eqo r wgt/i gpgtcvgf " rku" qh" tcpf qo " pwo dgtu" *O letquqh"Gzegn" Tgf o qpf ."Y cuj kpi vqp."WUC+0'Rctvlekr cpw"y gtg"kpwtwvfg "vq"eqpuwo g" cm'y g'o gcu'r tqxf gf "cpf "lphqto gf "vq'tgwtp"cm'ghv/qxgtu'y g"pgzv'xkuk0'Vj g\ "y gtg"cnq" cunfg "vq"tgeqtf "qp" c" hqqf "f kct {"uj gg"v"cp {"f gxkcvkp"htqo "y g" f kgv' Vj g" f khtgpeg"kp" gpgti {"cpf "o cetqpwtkgpv" kpvcngu" dgwy ggp" dqvj "xkuku" hqt" gcej "eqpf kkpq" y cu" y gp" o gcuwtgf 0'Vj g"cewcn'hqqf "eqpuwo gf "y cu" f gvto kpgf "d {"uwdtcevki "y g"co qwpv'qh'hqqf " i kxgp"d {"y g"co qwpv'qh'hqqf "rghv"cpf "y gp"cf f kpi "vq"y g"qvcn"cp {"wpcuuki pgf "cf f kkpqcn' hqqf "qt" f tlpmtgeqtf gf 0"

Vj g" gpgti {"cpf "o cetqpwtkgpv"eqpvgpv'qh"UQf kgv'cpf "Nkf kgv"y gtg"kf gpvlecn'ceeqt f kpi "vq" r ctvlekr cpw" f ckn\ "pwtkgpv'tgs wktgo gpw"*Tqf tki wgl "gv'cr0'422; + "cpf "ceeqwvki "hqt" hqqf " r tghgtpegu0'Vj g" f kgv'r tqxf gf "qp"cxgtci g"ø82' "qh'ectdqj {f tcvg."ø39' "qh'r tqvklp."cpf " ø45' "qh'hcv'qh'y g"qvcn'gpgti {"kpvcng0'Vj g"UQf kgv'eqpukwgf "qh'eqtphrcngu."y j qrg"o km" y j kg"dtgcf ."ej ggug."dgcpu."dwwgt."vqo cvq."r cuvc."vqo cvq"ucweg."cr r rg."cpf "dpcpcp0'Vj g" Nkf kgv'eqpukwgf "qh" F {o cvk g"Uwr gt"O cuui clpgt"Rqy f gt"*F {o cvk g."Dgf hqtf ."Vgzcu." WUC+"o kzgf "y kj "y j qrg"o km'cpf "y gtg"qhhtgf "kp"y j tgg"hrxqwtu<ej qeqrcvg."xcpkrc."cpf " utcy dgtt {"ceeqt f kpi "vq" gcej "kpf kxkf wcn'cvug"r tghgtpeg0'Gcej "ugtxkpi "*556"i + "eqpvkpu" 34: 2"necn"474"i "qh'ectdqj {f tcvg."74"i "qh'r tqvklp."cpf "32"i "qh'hcv' kpf kxkf wcn'gpgti {" tgs wktgo gpv'y cu"ecrewrcvgf "wukpi "y g"O khkhp/Uv'Lgqt"gs wcvkqp"cpf "y g"uj qtv'hqto "qh'y g" kpgtpevkqpcn'Rj {ulecn'Cevkxk\ "S wgunqppcktg"vq" f gvto kpg'y gk"guvko cvgf "dcucl'o gvedqrle" tcvg"cpf "r j {ulecn'cevkxk\ "hgxgn'tgur gevkggn\ *Kcs "4224=O khkhp"gv'cr0'3; ; 2+0Cnj qwi j "y g" J cttku"cpf "Dgpgf lev"gs wcvkqp" *J cttku" ("Dgpgf lev"3; 3: + "ku" v\ r kccm\ "wugf "d {"ur qt wu" pwtkklqpkwu."O khkhp/Uv'Lgqt"gs wcvkqp"y cu"uj qy p"vq"guvko cvg"dcucl'o gvedqrle"tcvg"y kj kp" 32' "qh'y cv'o gcuwtgf "*Hicpnghkgrf "gv'cr0'4227+= "y gtghqtg."kv'y cu" wugf "kp"y g"r tguvpv"

uwf {0P wtkleu"uqhy ctg"*P wtkleu"NVF."F wdrp."Kgrcpf+"y cu"wugf "v"eqputwev"y g"46/
j qwt"o gpw"ht"y g"UQf kgv"cpf "v"cpn{ug"y g"cf f kkpncn"lqqf "eqpuwo gf "d{"r ctvlekr cpw"qp"
vgukpi "f c{u0"
"

4.3.3 Statistical analyses

Ucwkuecn"cpn{ugu"y gtg"r gthqto gf "wukpi "URUU"x044"*DO "eqtr 0"Cto qpm"P [."WUC+0'
Cm'f cwc"y gtg"pqto cm{ "f kwtldwgf "cpf "y gtgthqg"r cktgf/uco r ng"t"vguw"y gtg"wgf "v"
eqo r ctg"y g"o gcp"gpgti {"cpf "o cetqpwtkpw"kpvcngu"dgy ggp"f c{"3"cpf "f c{"4"ht"gej "
o gy qf 0'Vj g"f cwc"y gtg"cpn{ugf "wukpi "y g"Drcpf "("Cno cp"*O ctvlp"Drcpf "("Cno cp"
3; : 8+"vej pls wg"ht"cuuguukpi "ci tgggo gpv'dgy ggp"y g"y q"f c{u"qh'o gcwtgo gpw"ht"gej "
eqpf kkp0'Rgctup"vgu"y cu"wugf "v"o gcwtg"y g"eqttgrvqp"dgy ggp"f c{"3"cpf "f c{"4"lp"
pwtkpv"kpvcng"ht"gej "o gy qf 0'k"cf f kkp."y g"eqghlekp"qh"xctkvp"*EX"? "322"z"
o gcpIUF+"y cu"ecrwcvgf "ht"gej "pwtkpv"ht"y g"y q"o gy qf u"cpf "tgr qtvf "cu"y g"
cxgtci g"EX" 0'Vj g"uco r ng"uk"y cu"ecrwcvgf "wukpi "y g"gs wvqp"r wdrkj gf "d{"J qr nku"
*4222+"cpf "dcugf "qp"y g"tguwu"qdvkpgf "k"qwt"r tgxkqu"uwf {"*Ej cr vt"5+0'Vj g"
ecrwcvp"uj qy gf "y cv"4: "r ctvlekr cpw"y gtg"pggf gf "v"i kxg"cf gs wvg"r tgeukqp"ht"
pwtkpv"kpvcng0J qy gxgt."c"qvcl"qh"54"r ctvlekr cpw"y gtg"tgetvkgf 0'Ucwkuecn"uki phkepeg"
y cu"ugv'cv'p >"070'
"

4.4 Results

Vj kv{"cy ngvu"htqo "hwt"f khtgpv"f kuer kpgu"tqy kpi."vkvj nq."e{ekpi."cpf "hqqvcm"
r ctvlekr cvgf "k"y ku"uwf {0'Vy q"r ctvlekr cpw"y kj f tgy "htqo "y g"uwf {"qpg"ht"r gtuqpcn"
tgcuppu"cpf "y g"ugeqpf "ht"hgkpi "pcwugqu"fwtkpi "y g"NKkgv0'Vj g"tgo clkpi "4: "
r ctvlekr cpw"y gtg"*o gcp"0'UF+"4: "09"{gctu"qrf."968"0'; 0'mi "k"dqf {"o cuu."cpf "39; "0: "
eo "k"j gki j v0'

Vj g"tguwu."cu"uj qy p"kp"Vcdng"68."kpf kcvg"y cv"y g"o gcp"gpgti {"cpf "o cetqpwtkpv"
kpvcngu"dgy ggp"f c{"3"cpf "f c{"4"ht"dqj "fkgvt{"ucpf ctf kcvqp"vej pls wgu"y gtg"pqv"
uki phkecpw{"f khtgpv0'kpvcngu"qp"f c{"3"cpf "f c{"4"cetqu"gpgti {"cpf "ectdj {f tcvg"y gtg"
eqo r ctgf "wukpi "uecvgt"r nqu"y kj "; 7' "rko ku"qh"ci tgggo gpv'cu"uj qy p"kp"Hk wtgu"68666.

y j gtgcu"r tqv~~g~~l~~p~~"cpf "hcv"y gtg"eqo r ctgf "wulpi "nko ku"qh"ci tgggo gpv"lqwpf "l~~p~~"Vcdrg"40"Cu"
 ecp"dg"uggp"l~~p~~"v~~j~~ g"l~~h~~i wtgu."v~~j~~ g"qdugtxc~~l~~qpu"l~~p~~"UQf lgv"cpf "N~~K~~ lgv"y gtg"f kwtldwgf "ctqwpf "
 v~~j~~ g"o gcp"y k~~j~~ "v~~j~~ g"gzegr ~~l~~q~~p~~"qh"uqo g"qwdgtu0"Vj g"nko ku"qh"ci tgggo gpv"l~~p~~"v~~j~~ g"UQf lgv"lqt"
 cm'pwtl~~g~~pwu"y gtg"y kf gt."cmo quv"vy l~~g~~"l~~p~~"uqo g"xctkcdrgu."v~~j~~ cp"qh"v~~j~~ g"N~~K~~ lgv0"Vj tgg"
 r ct~~l~~ekr cpw"l~~p~~"UQf lgv"f l~~h~~gtgf "l~~p~~"v~~j~~ g~~l~~"ectdqj {f tcv~~g~~"l~~p~~vcng"dgwy ggp"f c{"3"cpf "f c{"4"d{"
 o qtg"v~~j~~ cp"322"i "eqo r ctgf "v~~l~~"qpn{ "qpg"r ct~~l~~ekr cpv"l~~p~~"N~~K~~ lgv0

"

Vcdrg"60800 gcp"gpgti {"cpf "o cetqpwtl~~g~~pwu"l~~p~~vcngu"qh"v~~l~~ckpgf "cv~~j~~ ngvu"qp"f c{"3"cpf "f c{"4"
 qh"UQf lgv"cpf "N~~K~~ lgv"eqpuwo r ~~l~~q~~p~~"

O g j qf "	F c{"3"	UF "	F c{"4"	UF "	p"xcmg"
	"	"	"	"	"
SOdiet					
Gpgti {"*necm"	4"; 92"	835"	4"; ; 9"	867"	089"
Ectdqj {f tcv g "*i +"	685"	32: "	677"	33: "	06; "
Rtqv g l p "*i +"	349"	54"	349"	49"	02"
Hcv g "*i +"	94"	44"	96"	48"	052"
	"	"	"	"	"
LIdiet					
Gpgti {"*necm"	5"35; "	843"	5"362"	845"	0: "
Ectdqj {f tcv g "*i +"	697"	344"	697"	345"	0; "
Rtqv g l p "*i +"	353"	48"	354"	48"	073"
Hcv g "*i +"	99"	3: "	99"	3: "	0: "

"

"

"

"

"

"

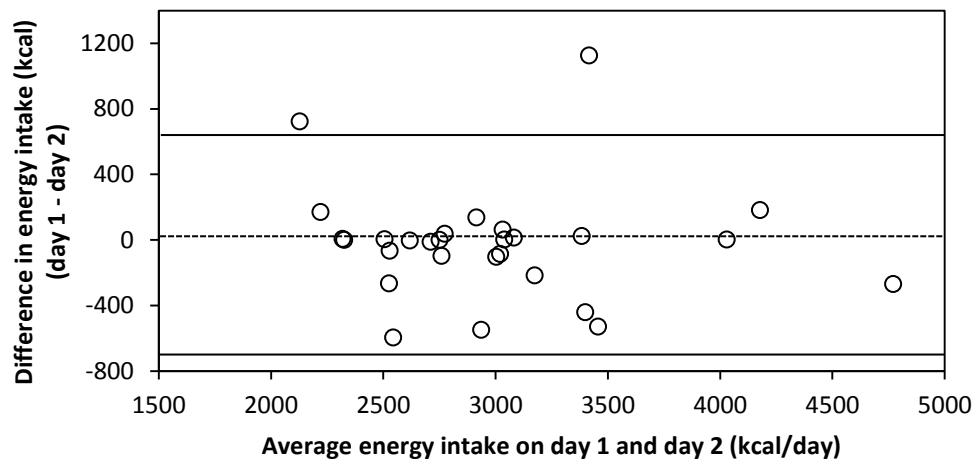
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 vclp'gf'c'j ngv'u'dgy ggp'f'c{'3'cpf'f'c{'4'qh'UQf'kgv'cpf'Nk'kgv'equwo r vqp'

		Nko ku'qh'ci tggo gpv'	
O gyj qf "	O gcp'f'khtgpeg"	Nqy gt"	Wf r gt"
SO diet	"	"	"
Rtqv'p'p'f' +"	207"	/590"	5: 0"
Hcv'p'f' +"	/307"	/420"	3906"
LI diet	"	"	"
Rtqv'p'p'f' +"	/20 "	/370"	3505"
Hcv'p'f' +"	206"	/350 "	3608"

"

"

"

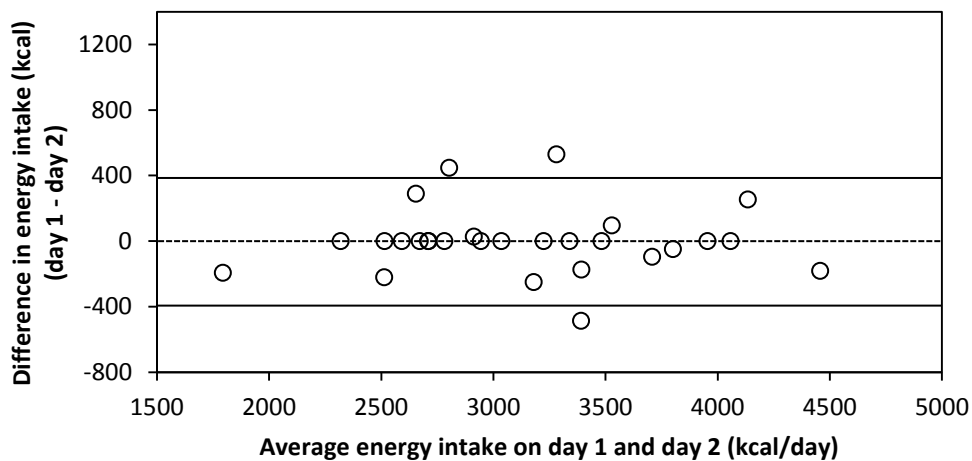


"

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UQf'kgv'gej pks wg0'

"

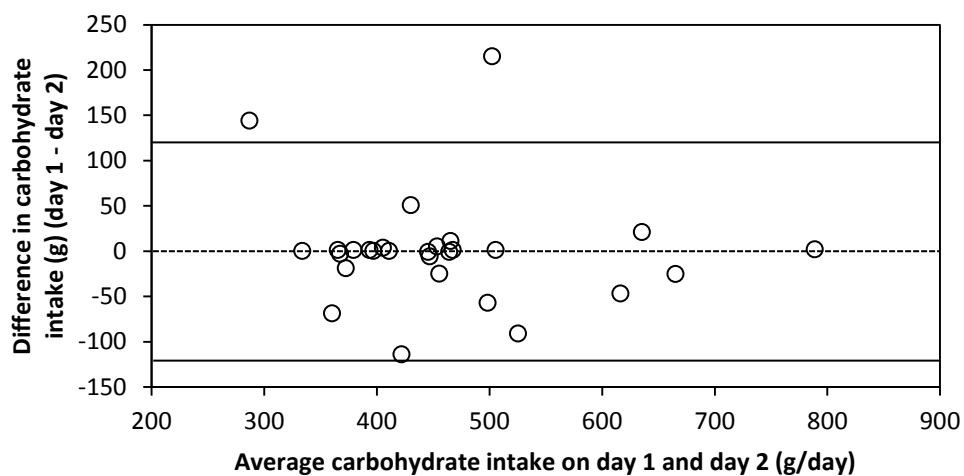


"

Hi wtg"6040Ego r ctkuqp"qh'yj g"co qwpv'qh'gpgti { "eqpuwo gf "qp"f c{"3"cpf "f c{"4"lqt"yj g"
NK kgv'gej plk wg0'

"

"

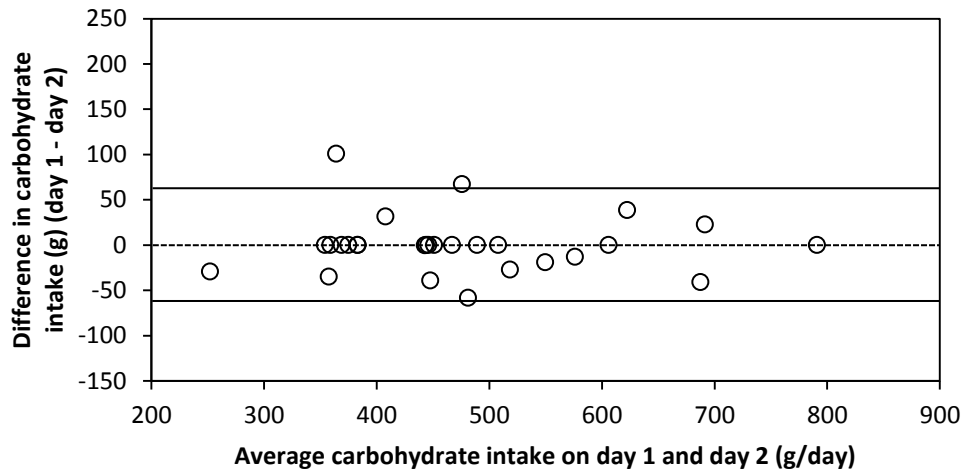


"

Hi wtg"6050Ego r ctkuqp"qh'yj g"co qwpv'qh'ectdqj { ftcvg"eqpuwo gf "qp"f c{"3"cpf "f c{"4"lqt"
yj g"UQf kgv'gej plk wg0'

"

"



Hk wtg'6060Eqo r ctktqp'qh'yj g'co qwpv'qh'ectdqj { f tcv'eqpuwo gf "qp"fc { "3"cpf "fc { "4"ht " yj g'NK kgv'gej pks wg0'

"

Vj g'EX' "qh'gpgti { "cpf "o cetqpwtkgpu"ht "UQf kgv'y gtg"j ki j gt "yj cp "NK kgv'*7' "cpf "5' " ht "gpgti { =7' "cpf "5' "ht "ectdqj { f tcv'=7' "cpf "4' "ht "rtqvgk=cpf "7' "cpf "5' "ht "hcv." tgr gevkgn { 0'Rgctup "guv'uj qy gf "yj cv'ht "UQf kgv."gpgti { "cpf "o cetqpwtkgpv'kpcngu"qp" fc { "3"y gtg"xgt { "utqpi n { "eqttgrv'gf "y kj "yj qug"qp"fc { "4"*t"? "0 7"ht "gpgti { ".t"? "0 7"ht " ectdqj { f tcvg."t"? "0 2"ht "rtqvgk"cpf "t"? "0 5"ht "hcv0Vj g'tgrv'kpuj k "qh'yj g'gpgti { "cpf " o cetqpwtkgpu"kpcngu"dgvy ggp"fc { "3"cpf "fc { "4"ht "NK kgv'y cu"xgt { "utqpi "cu"y gm=" j qy gxgt."yj g'xcngu'y gtg"j ki j gt "yj cp "UQf kgv'gzegr v'ht "hcv*t"? "0 6"ht "gpgti { =t"? "0 8"ht " ectdqj { f tcvg="t"? "0 8"ht "rtqvgk"cpf "t"? "0 4"ht "hcv0Cm'eqttgrv'kpu"y gtg"ucv'kncm { " uki phtecpv'k"dqyj "o gj qf u"*p">'03+0'

"

4.5 Discussion

Vj g"ucpf ctf kugf "rtg/r cenci gf "f kgv"j cu"dggp"eqpukf gtgf "yj g"dguv'o gj qf "ht "eqpvtqnkpi " f kgvct { "kpcng"fwtkpi "yj g"vkn'r tgr ctkv'kp"r gkqf "Igcqeng" ("Dwtng"4232+0Vj g'o clp" cf xcpvci gu'qh'yj ku'gej pks wg'kpenf gu'yj g'eqo r rlcpeg"qh'uwdlgeu"vq"yj g'f kgv'i kxgp"y j kej " eqwrf "dg"gcukn { "ej gengf "d { "cunkpi "uwdlgeu"vq"dtkpi "dcem'yj g'ghxgtu."cpf "yj g'my "dwtf gp" qp"r ctv'ekr cpw"grko kpcv'kpi "yj g'pggf "vq"dw { "cpf "eqqm'yj gk"o gcnu0J qy gxgt."y j kg"kv" tgf wegu'yj g"dwtf gp"qp"r ctv'ekr cpw."kv'kpetgcugu'yj g"dwtf gp"qp"tuguctej gtu0Vj ku'gej pks wg"

ku'ko g'equwo kpi "cpf "equw{ "eqo r ctgf "v"vj g"qvj gt "f kgvt { "ucpf ctf kucvqp "vej pls wgu0k{
 cf f kkp. "f gur kg"vj g"i qpf "rgxgn'qh"eqo r rkepeg"d{ "vj g"o clqtk{ "qh'r ctvlekr cpwu. "vj g"uwf { "
 r tguvpgf "kp" Ej cr vgt "5" j cu'uj qy p"vj cv'vj g"r t g/r cenci gf "f kgv" vej pls wg" ukm'j cu" c" hgy "
 uwdlgeu" y kj " r qqt" eqo r rkepeg0' Vj ku" xctkdkrk{ " kp" f kgvt { " kpvcng" ecp" eqphqwpf "
 gzr gt ko gpvcr' tguwu" cpf "o cng" k' o qtg" f khlwv" vq" f gvev" ej cpi gu" cuuqekvgf "y kj "vj g"
 kpvgtxgpvqp. "gur gekm{ "kp" uwf kgu'y kj "c" uo cm' uco r ng' uk g0'

Vj g" htu' s wguvqp "kp" y ku' uwf { "uqi j v' vq" f gvgto kpg" yj g" tgr tqf wekdkrk{ "qh" UQf kgv" cpf "
 NK kgv" kp" cv' ngvu0Cu" gzr gevfg. "vj g" o gcp" gpgti { "cpf "o cetqpwtkgpv" kpvcngu" qp" f c { "3" cpf "
 f c { "4" hqt" dqj " vej pls wgu" y gtg" pqv' uki pkkecpv{ " f khtgtpv0' J qy gxgt. "y kj kp/ uwdlgev"
 f khtgpegu" o c { "dg" qduwtf "d { "tcf kkpncn' ucwvkecn' cpcn{ uku" *Y gkuu gt dgt "gv" cn0' 4237+0'
 Hwt vj gt "cpcn{ uku'uj qy gf "vj cv' dqj " vej pls wgu" ngf "vq" i qpf "eqo r rkepeg" vq" yj g" f kgv' i kxgp" cu"
 uj qy p" kp" yj g" Dncpf" ("Cno cp" r m' u' y j gtg" o qu' xcmgu" y gtg" ctqwpf "vj g" o gcp0' Vj ku' ku"
 uwr r qtvgf "d { "vj g" utqpi "eqttgcvqp" dgvy ggp" pwtkgpv" kpvcng" qp" f c { "3" cpf "f c { "4" qh" dqj "
 vej pls wgu0' J qy gxgt. "uqo g" f luetgr cpekgu" y gtg" cr r ctgvp" kp" uqo g" r ctvlekr cpwu. "o clpn{ "kp"
 UQf kgv0' Cu" o gpvqpfgf "kp" ugevpq "606. "o qtg" r ctvlekr cpwu" kp" yj g" UQf kgv' f khtgdf "kp" yj gkt "
 ectdqj { f tcvg" kpvcng" dgvy ggp" f c { "3" cpf "f c { "4" d { "o qtg" vj cp" 322" i "vj cp" kp" yj g" NK kgv0' Vj ku"
 y cu" o clpn{ "f wg" vq" gcvpi "uki pkkecpv{ " gcvpi "ngu" y j kg" dtgcf. "r cuv" qt" c" eqo dkecvqp" qh"
 dqj "qp" qpg" qh" yj g" vy q" qeecukpu0' Cp" ko r rkecvqp" qh" yj ku' ku" yj g" r quukdkrk{ "vj cv' yj gug"
 f khtgpegu" kp" ectdqj { f tcvg" kpvcng" ecp" kpetgcug" uki pcn' pqkug" cpf "tgf weg" yj g" cdkrk{ "vq"
 f gvev" uo cm' y qtj y j kg" ej cpi gu0' P gxgt vj gngu. "tugctej gtu" ctg" gzr gevfg "vq" ej gen' yj g"
 eqo r rkepeg" qh" yj gkt "uwdlgeu" gxgp" y j gp" yj g" i qnf "ucpf ctf "o gvj qf " *Q0' U_{fkgv} " j cu" dggp "
 wugf 0' Vj g { "eqwrf "gkj gt "wug" c" ej gen' ku' qt" uko r n{ "cun' yj gkt "uwdlgeu" vq" tgwtp" yj g" rghxqgtu0'
 Vj ku" y c { " yj gug" f luetgr cpekgu" kp" gpgti { "cpf "o cetqpwtkgpv" kpvcngu" eqwrf "dg" cxqkf gf 0'
 J qy gxgt. "kp" ecug" qh" c" rti g" uco r ng' uk g. "ej gen' pi "vj g" eqo r rkepeg" qh" r ctvlekr cpwu" o li j v"
 dgeqo g' ko r tcevecn' cpf "vj gtghgtg" NK kgv' dgeqo g' yj g' dguv' ej qleg0'

Vj g' tguwu" qh" yj g" EX' "cnuq" eqphkto "vj cv" UQf kgv' cpf "NK kgvctg" dqj "ghgevxg" vej pls wgu"
 vq" ucpf ctf kug" f kgvt { "kpvcng" rcf kpi "vq" uko kct "xctkcvqp" kp" pwtkgpv" kpvcngu0' Nks vkf "r t g/
 r cenci gf "o gcu" vej pls wg" ku" cp" kf gcn' vej pls wg" hqt "uwf kgu" y kj "uo cm' uco r ng' uk g" cpf lqt "
 mqm' kpi " hqt" uo cm' y qtj y j kg" ej cpi gu0' Vj g" kpvg/ uwdlgev" xctkdkrk{ " kp" gpgti { " cpf "
 ectdqj { f tcvg" kpvcngu" tgr qtvgf " kp" yj ku' uwf { " y cu" y kf g0' K' uggo u" r quukdng" yj cv' yj ku"
 xctkdkrk{ "ku" f wg" vq" yj g" f khtgpegu" kp" yj g" v{ r g" qh" cv' ngvu" tgetwkgf "y j q" j cxg" f khtgtpv"
 pwtkgpv" tgs vkt go gpwu" cpf "vj gkt "dqf { "y gli j 0' Hqt" gzco r ng. "vj g" ectdqj { f tcvg" kpvcng" qh" c"

e{erku'y gli j kpi "8502"mi "y cu"588"i "cpf"qh"cpqvj gt"e{erku'y gli j kpi "; ; 04"mi "y cu"874"i 0
Vj ku" xctkckqp" eqwrf " kpetgcug" yj g" y kf yj " qh" yj g" eqphkf gpeg" kpgtxcn" yj gtghqtg." k" ku"
uwi i guvgf "vq"tgetwk"uwdlgeu"y kj "uko krt"ej ctcevgtkueu"vq"tgf weg"yj g"dgy ggp/uwdlgeu"
xctkcdkxk{*J qr nkpu"gv'cn03; ; ; +0

Equv'cpf "vko g"qh'r tgr ctckqp"y gtg"vy q"qh"yj g"o ckp"rko kcvkpu"qh"UQf kgv'tckugf "gctrkgt0
Eqo r ctkpi "yj g"vy q"vgej pls wgu."yj g"cxgtci g"equv'qh"UQf kgv'r gt"r ctckr cpv'r gt"tken'y cu"
C8082"eqo r ctgf "vq"C60 2"ht"NK kgv0Vj ku"f qgu"pqv'eqxgt"yj g"equv'qh"ndqwt."r nruke"dcu u"
cpf "dqwgu."uqhvy ctg'r cenai g."cpf "qvj gt"equwo cdngu0Vq'r wv'y ku"lp"eqpvgzv."yj g"cxgtci g"
equv'qh"UQf kgv'ht"52"r ctckr cpw'wpf gti qkpi "vy q"tken'ku"C5; 8022"eqo r ctgf "vq"C4; 6022"
ht"NK kgv0k"cf f kkp."yj g"cxgtci g"vko g"ur gpv'r gt"xkuk'r tgr ctkpi "yj g"uqkf "r tg/r cenai gf "
f kgv'y cu"mpi gt"yj cp"r tgr ctkpi "yj g"rks wkf "r tg/r cenai gf "f kgv"*42"o kpwgu"cpf ": "o kpwgu."
tgur gevkgxgn{+0Vj ku"f khtgpeg"kp"vko g"ecp"chgev'f tco cvkcm{ "uwwf lgu"y kj "rti gt"uco r ng"
uk g0

Hkpcmf." qpg" rko kcvkqp" pggf u" vq" dg" eqpukf gtgf 0' Vj g" gpgti { " gZR gpf kwg" qp" yj g" f c { "
r tgegf kpi "gcej "xkuk'y cu"pqv'o gcwgtf="yj gtghqtg."kv'y cu"pqv'r quukdg"vq"gzco kpg'y j gyj gt"
yj g"ej cpi gu"kp" f kgvt { " kpcng"y gtg"cuqekcvf"y yj "cp{ "ej cpi gu"kp"r j { ulecn'cevxxk{0'
J qy gxgt."r ctckr cpw'y gtg"cumgf "vq"nggr "yj gk"r j { ulecn'cevxxk{ "ngxgn'cu'emug"cu'r quukdg"
r tkqt"vq"gcej "tken0

"

4.6 Conclusion

Vj g'r wtr qug"qh"yj g"ewtgpv'uwwf { "y cu"vq"cuuguu"yj g"cdkxk{ "qh"cyj ngvu"vq"tgr rkecvg"cf kgv"
y j gp"NK kgv" cpf "UQf kgv"y gtg" wugf "cu" f kgvt { "ucpf ctf kcvkqp" vgej pls wgu0' Vj ku" uwwf { "
eqphkto u"vj cv'vj g'rks wkf "r tg/r cenai gf "f kgv'ku"cp"ghgevxg"vgej pls wg"vq"ucpf ctf kug" f kgv'r tg/
gZR gtlk gpcn' tken" cpf "eqwrf " dg" wugf "cu" cp" cnvgtpcvxg" vq" uqkf "r tg/r cenai gf "f kgv0'
Hwtj gto qtg."NK kgv'o c{ "ngcf "vq"cf f kkpncn'ko r tqxgo gpw'lp"yj g"eqo r kcepg"qh'uwdlgeu"vq"
yj g'f kgv'cpf "cnq" f getgcug"yj g"equv'cpf "vko g"qh'r tgr ctckqp0'

"

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"

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Chapter 5

**Does a 15% difference in carbohydrate intake
influence cycling performance and
physiological responses in endurance-trained
athletes?**

5.1 Summary

Cm j qwi j "tgugetej gtu"qhvgp"lphqto "j wo cp"r ctvlekr cpw"vq"cf j gtg"vq"vj g"uco g"fgv'dghqtg" o wnk/f c{ "g zr gt ko gpw. "vj g"v{ r kecn' uwdlgev"ku"rkngn{ "vq"xct{ "vj gkt"ectdqj { ftcvg"kpvcng"d{ " 37" "qt"o qtg0Y g"gzco kpgf"vj g"ghgev"qh"37" "f khtgpeg"lp"vj g"ectdqj { ftcvg"kpvcng"qh" vclpgf"e{erkuu"qp"gpf wtcepg"r gthqto cpeg"cpf"r j { ukqmi kecn'tgur qpug0Vgp"o cng"e{erkuu" eqo r ngvgf" hco kktkucvqp" cpf" cgtqde" r qy gt" vguu0 Vj gp. "qp" vy q" ugr ctcvg" qeecukpu. " uwdlgeu"eqo r ngvgf" c"i n{eqi gp" f gr ngvqp"vuni"fc{ "3+"hmqy gf" d{ "cp"gpf wtcepg"ecr cek{ " vguv'cv'92' "qh"XQ4o cz"qp" c"e{eng"gti qo gvg"v"vkn'hvki wg"1Q0Vko g"vq"gzj cwukqp=f c{ "4+0' Rctvlekr cpw" tgr rlecvgf" vj gug" r tqegf wtgu" wulpi " c" tcpf qo kugf" etquu/qxgt" f guki p" cpf " eqpuwo gf" gkj gt" c" fkgv' eqpvcklpi "60"i 0mi "DO^{/3}"qh"ectdqj { ftcvg"*Nqy gtEctd+"qt"cp" gpgti {/o cvej gf" fkgv'eqpvcklpi "76"i 0mi "DO^{/3}"qh"ectdqj { ftcvg"*J ki j gtEctd+"dgw ggp"vj g" i n{eqi gp" f gr ngvqp"vuni"cpf"vko g"vq"gzj cwukqp"vgu0Vj g"vy q" qeecukpu'y gtg"ugr ctcvgf" d{ " cv'rgcu'9/f c{ u0'Dmqf"i n{equg"cpf"n{evvg"rgxgnu"y gtg"o gcuwgf"cv'dcugrkpg"cpf"gxgt{ "52" o kpwgu"fwlpi "e{erkpi ".y j kng"vj g"tgur ktcvt{ "gzej cpi g"tcvkq"*TGT+"y cu"o gcuwgf"gxgt{ " 37"o kpwgu"vkn'vj g"gpf"qh"vj g"vko g"vq"gzj cwukqp0Vko g"vq"eqo r ngvqp"y cu"pqv'chgev" d{ "J ki j gtEctd": 60'390"o kp+"eqo r ctgf"vq"Nqy gtEctd": 08'370"o kp+"y kj "p"? "0 80' J ki j gtEctd"cuq"fkf"pqv"j cxg"cp{ "uki plhlecpg"ghgev"qp"dmqf"n{evvg"cpf"i n{equg"rgxgnu. " cpf" TGT"cv"cp{ "vko g"r qkpveqo r ctgf"vq"Nqy gtEctd"*p @027+0Vj ku"uwf { "uwi i guu"vj cv" c" f khtgpeg"lp"ectdqj { ftcvg"kpvcng"d{ "w"vq"37" "f qgu"pqv'ghgev"qp"e{erkpi "r gthqto cpeg. " pwtlpgv'qz kf cvkqp. "dmqf"i n{equg"cpf"n{evvg"rgxgnu0

"

5.2 Introduction

Ceeqtf lpi "vq"vj g"tgxky "rtgugpvgf"lp"Ej cr vtg"4. "cr r tqzko cvgn{ "87" "qh"uwf lgu"r wdrkuj gf" lp"KLUP GO "cpf" LKUP "gkj gt" f q"pqv'ej gem'uwdlgeu"eqo r rkepg"vq"vj g"fgv'i kxgp"qt" f q" pqv'o gpvqp"ko0Vj ku"ko r ngu"vj cv'tgugetej gtu"o c{ "dg"vknpi "f kgvt{ "ucpf ctf kucvqp" hqt" i tcpvgf0 Vj ku" eqwf" dg" f wg" vq" vj g" n{em' qh" uwf lgu" j ki j rki j vki " ku" ko r qtcpeg0 P gxgtvj gruu. "r qqt" f kgvt{ "eqvtqn'o ki j v'j cxg"ugtqwu"eqpugs wgpegu" d{ "etgcvki "rcti g" y kj kp/"cpf" dgw ggp/uwdlgev"xctkcdk{ "kp" f gr gpf gpv"xctkcdgu"ngcf lpi "vq" c" f getgcugf " ghgevuk g. "j ppeg"lpcf gs wcv"gzr gt ko gpvnr qy gt"*Cvnpuqp"("P gxkn'4223=J qr nkp'u'gv'crl' 3; ; ; +0Vj gug" hpf lpi u"ngf "wu"vq"eqpf wev" c"uwf { "gzco kplpi "vj g"tgr tqf wekdtk{ "qh" c" f kgv' wulpi " f khtgpgv' f kgvt{ "ucpf ctf kucvqp" vgej pls wgu" *Ej cr vtg" 5+0 Vj g" tguwu" qh" vj ku"

lpxgunki cvkqp"uj qy gf "y cv"y g"cxgtci g"o qf gtcvgn{ /vclpgrf "cvj ngv"ku"rkngrf "vq"xct{ "y gkt" fcln{ "ectdqj {f tcvg"lpcvng"d{ "37" "qt"o qtg."gxgp"y j gp"y g{ "y gtg"cumgf "vq"tgr tqf weg"y gkt" 46/j "fkgv0"

Uelgpkvku"j cxg"gzvgpukxgn{ "lpxgunki cvgf "y g"ghge"qh"ectdqj {f tcvg"fkgv"qp"gpf wtcepg" r gthqto cpeg"cpf "o gvcdrkuo 0' [gv."uwf lgu"o clpn{ "hgewgf "gkj gt"qp"eqo rctkpi "vy q" gzvtgo g"fkgv"*9"ó"; "i 0ni ^{/3}"DO "fkhgtgpeg"kp"ectdqj {f tcvg="Dkuj qr "gv"cr0"4223c."4223d=" Lqj puqp"gv"cr0"4228+"qt"vy q"fkgv"y kj "o qf gtcv"fhgtgpegu"*5"i 0ni ^{/3}+"lp"ectdqj {f tcvg" eqpvgpw"*Dwtng"gv"cr0"4222="J cy ng{ "gv"cr0"3"; ; 9="Rkukrf ku"gv"cr0"3"; ; 8="Y knkco u"gv"cr0" 3; ; 4+0Vj g"fkhgtgpeg"kp"y g"co qwpv"qh"ectdqj {f tcvg"dgw ggp"y g"vy q"fkgv"lpi guvgf "kp" yj gug"uwf lgu"fhgtgf "d{ "cv"ngcu"44' "Y knkco u"gv"cr0"3; ; 4+"cpf "tgcej gf "; ; ' "Lqj puqp"gv" cr0"4228+0Vj g"o clp"hpf lpi "qh"y gug"uwf lgu"y cu"y cv"gpf wtcepg"r gthqto cpeg"y cu"i tgcvgt" y j gp" rctvlekr cpw" lpi guvgf "c" j ki j "ectdqj {f tcvg" fkgv" *Eqttgk/Qrkxgk" gv" cr0" 4235=" QdMgghg"gv"cr0"3; ; ; +0"

Vj g"eqpuwo r vqp"qh"ectdqj {f tcvg"tlej "fkgv"lpetgcugu"i n{eqi gp"ngxgnu"lp"ungrvcn'o wuergu." yj g"r tko ct{ "ecwug"ht"y g"ko r tqxgo gpv"lp"gpf wtcepg"r gthqto cpeg"*Tcej "gv"cr0"4227+0' Gzgtekg"lpvgpuk{ "r r{u"cp"ko r qtvcpv"tqng"lp"y g"tgncvqpj kr "dgw ggp"i n{eqi gp"ngxgn' *fgr ngvqp+"cpf "gpf wtcepg"r gthqto cpeg"*hvi wg+0I qmplem'et al."*3; 96+"tgr qtvgf "y cv"cu" gzgtekg"lpvgpuk{ "lpetgcugu"vko g"vq"tgcej "hvi wg"f getgcugu" r ctvcm{ "f wg"vq"y g"tcr kf" f getgcug"lp"i n{eqi gp"ngxgn'f wtkpi "gzgtekg0' Hqt"gzco r ng."cv"o gf kwo "lpvgpuk{ "86" " XQ4o cz+"i n{eqi gp"ngxgn'tgcej gf "etklecm{ "ny "ngxgnu"chgt"vy q"j qwtu."y j gtgcu"cv"j ki j " lpvgpuk{ "6" "XQ4o cz+"ny "ngxgnu"y gtg"tgcej gf "chgt"82"o kpwgu"qh"gzgtekg0' Kp" cffklqp." j ki j "lpvgpuk{ "gzgtekg"uki phlecpw{ "lpetgcugu"dmqf "ncevg" eqpegpvcvqp" eqo rctgf "vq"o gf kwo "lpvgpuk{ "gzgtekg0'Uko kct"tgpfu"j cxg"cnuq"dggp"qdugtugf "dgw ggp" j ki j "cpf "ny "lpvgpuk{ "gzgtekg"ht"TGf"cpf "qz{ i gp"wr veng0"

Vj gug" r tqveqni" y gtg" o clpn{ "cf cr vgf" d{ "uelgpkvku" y j q" y gtg"gzco klpki "fkhgtgpv" utcvgi lgu" vq" gpj cpeg" gpf wtcepg" r gthqto cpeg" cpf "cngt" uwdutcvg" qzlf cvkqp" f wtkpi " gzgtekg0J qy gxgt."vq"qwt"npqy ngf i g"pq"qpg"j cu" {gv'cf f tguugf "y ku'y kj "tgi ctf u'vq" fkgvct{ " ucpf ctf kucvqp"qh'tgugctej "uwf lgu0Y j cv"ku"npqy p"cdqw"y g"ko r cev'qh'c"uo cm'f khgtgpeg" kp"ectdqj {f tcvg"lpcvng"qp"gpf wtcepg"r gthqto cpeg"ku'rcti gn{ "dcugf "wr qp"y g"eqpvtqn'i tqwr u" kp" uqo g" uwf lgu" *Dty gt" gv" cr0" 3; ; : = "O wklq" gv" cr0" 3; ; 6= "Tqnuj " gv" cr0" 4224= "Xgpnvco cp" gv" cr0" 4223+0' Hqt"gzco r ng."kp" Dty gt" et al."*3; ; : + "y g"eqpvtqn'i tqwr " kpenf gf "gzr gtlgpegf "twppgtu"y j q"y gtg"lphqto gf "vq"o clpvclp"y gkt"ectdqj {f tcvg"lpcvng"

dgy ggp" tlcnu0' Vj g" cxgtci g" f khtgpeg" kp" ectdqj { ftcvg" kpcng" *pqp/ucpf ctf kugf + " qpn { " f khtg" d { "5; "i "35' +0J qy gxgt. "gpgti { "kpcng" y cu" kpetgcugf "d { "932" necn' qp" yj g'ugeqpf " qeecukqp" kp" qtf gt" vq" ucpf ctf kug" k' y kj " yj g" qj gt" gzt gt ko gpvni' tqwr u0' Vj gtghgtg. " yj gtg" ku" c" pggf " vq" eqpf wev" c" y gm/eqpvtqngf " uwf { " f guki pgf " ur gekh'ecm { " vq" gzco kpg" c" uo cm" f khtgpeg" *kq0' c" tgrtgugpvc'xg" f khtgpeg" dcugf " qp" v { r'lecn' cyj ngv" dgj cxkqwtu" kp" ectdqj { ftcvg" qp" gpf wtcepeg" r gthqto cpeg" cpf " r j { ukqmi lecn' t'gur qpug0' Vj g" r wtr qug" qh" yj ku" kpxguki cvkqp" y cu" vq" eqo r ctg" yj g" ghge'v' qh" c" 37' " f khtgpeg" kp" 46/j qwt" ectdqj { ftcvg" kpcng" qp" gpf wtcepeg" ecr cek { . " pwtkgpv" qz kf cvkqp" cpf " dnqf " dkqo ctngtu" f wtkpi " e { erkpi " kp" cyj ngvu0'

5.3 Materials and methods

5.3.1 Subjects

Hqwtvgp" j gcnj { " y gm/vtclpgf " o crg" e { erkuu" cpf " tlcvj ngvu" r ctvlekr cvgf " kp" yj ku" uwf { 0' Cyj ngvu" y gtg' tgetwk'gf " htqo " ur qt w' enwdu" kp" Qzhqtf uj ktg" yj tqwi j " yj gkt' t'gur gev'xg" eqcej gu0' Gki kdkrk { " etkgtk' kpenw' gf < "

- Cyj ngvu" ci gf " dgy ggp" 3: /64" { gctu" }
- Y kj " cp" cgtqdk' ecr cek { " cdqxg" yj g"; 2yj " r gtegp'v'g' hqt" yj gkt' ci g" 3: /4; " { gct < " 77" o rmi ^{/3} 0 kp ^{/3} = 52/64" { gct < " 74" o rmi ^{/3} 0 kp ^{/3} = Y j crg { . 4228+ }
- P qv'cmgti le" qt' kpvqrgt' cpv' vq' hqf " r tqxkf gf "
- Htgg' htqo " kplw'kgu"
- Htgg' qh' o gvcdq' k' f kuqtf gt u" *g0 0f kcdg'vu. " ectf kqxcuew'et " f kugcug. " qt" j { r gtvgpukqp+ "

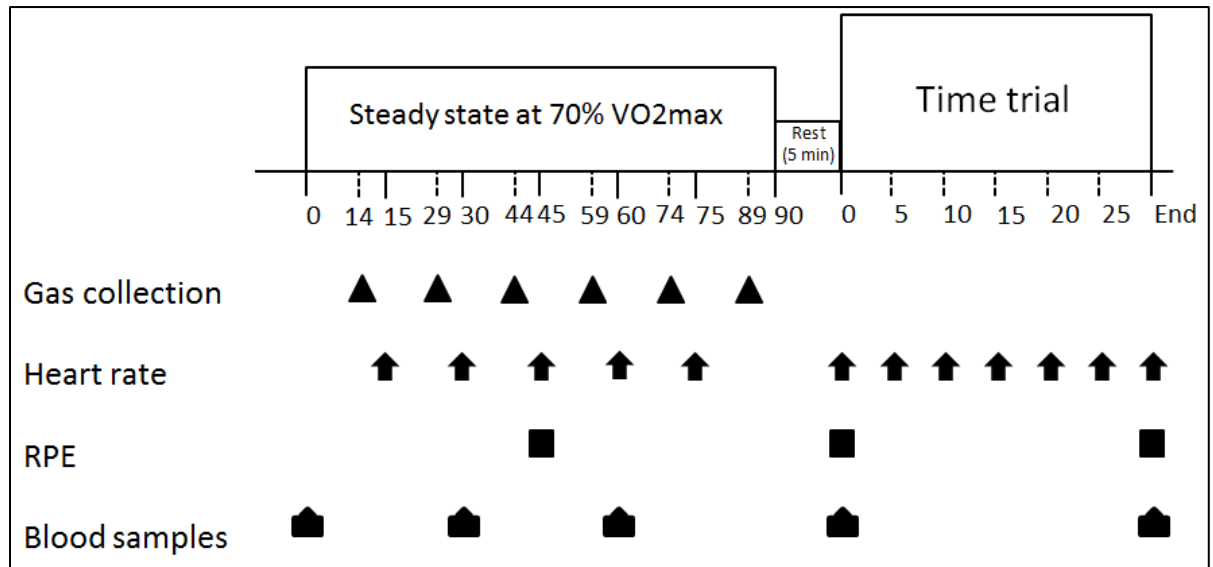
Vy grxg" r ctvlekr cpw' eqo r ngvf " yj g" uwf { " y j k'g" y q" r ctvlekr cpw' f tqr r gf " qw' hqt" r gtuqpcn' tgcuppu0' C" hwtj gt" y q" uwdlgeu" y gtg" gzenw' gf " r tkt " vq" uvcv'w'lecn' cpcn { uku" dgecwug" yj g { " eqo r ngvf " yj g" gpf wtcepeg" ecr cek { " vguv' kp" ngu" yj cp" 82" o kpwgu0' Vj g" r j { ulecn' ej ctcevgtku'eu" qh" yj g" h'kpcn' vgp" r ctvlekr cpw' y gtg" cu" hqmqy u" *o gcp " Ō' UF + < ci g" ? " 52" Ō' : " { gctu = dqf { " o cuu" ? " 9502" Ō' : 07" mi = j gki j v" ? " 3: 2" Ō' 8" eo = XQ40 cz < 790 " Ō' 50 " o rmi ^{/3} 0 kp / 30' Vj ku" uwf { " y cu" eqpf wevgf " ceeqtf kpi " vq" yj g" i w'kf grkpgu" rckf " f qy p" kp" yj g" F gerctcvkqp" qh" J gnukpnk' cpf " cm" r tqegf wtgu" kpxq'rkpi " j wo cp" uwdlgeu" y gtg" cr r tqxgf " d { " yj g" Wpkxgtuk { " Tgugctej " cpf " Gj' leu" Ego o kvgg" *WTGE + " cv" Qzhqtf " Dtqqngu" Wpkxgtuk { " *Cr r gpf kz " E+0'

Rtktq"vq"uvtvpi "j g"uwf { .r ctvkr cpv"i cxi"j gk"y tkwgp"lphqto gf "eqpugpv"cpf "eqo r ngvf "
c"i gpgtcn"j gcnj "s wguvqppckg"chgt"dgkpi "hwm" lphqto gf "qh"j g'r wtr qug"qh"j g"gzr gko gpv"
"

5.3.2 Pilot study

K'y cu"guugpvkn" gctn { "f wtkpi "j g"uwf { "f guki p"r gkqf "vq"ugrgev" c"uwkcdng"r gthqto cpeg"
r tqvqeqn"vq"cf f tguu"j g"tgugctej "s wguvqp0Vj ku"y cu"gur gekm { "ko r qtvcpv"cu"j g"gzr gev " "
ghgev"y cu"uo cm0Vj gtghqtg."ugxgtcn"r tg/vguvpi "uguukpu"y gtg"eqpf wvvgf "kpenw lpi "j g"
cuuguuo gpv"qh"j g"gs wkr o gpv0Vj g"htuv"r gthqto cpeg"r tqvqeqn"vguvgf "y cu" c"r tg/mcf gf "
e{enkpi "vko g"tkcn"y j lej "ku"r tgugpvvgf "kp"Hki wtg"7(B0K"eqpukvgf "qh" c"ugcf { "ucv"gzgtekug"
r j cug"mukpi "; 2"o kpwgu"cv"cp"kpvgpuk { "gs wcn"vq"92" "XQ4o cz"hmny gf "d { "c"hz gf "
f kucpeg" vko g" tkcn" cu" hcu" cu" r quukdg" *f wtcvqp" vti gv" 52" o kpwgu+0" J qy gxgt. " j g"
r ctvkr cpv"eqo r ngvf "j g"ugcf { "ucv"r j cug"y kj "c"j ki j "tcv"qh"r gtegxgf "gzgtvqp"*39"? "
xgt { "j ctf +0" Vj g"r ctvkr cpv" o quv" rkn { "tgcej gf " o kpo cn"i n{eqi gp"ngxnu"kp" j g"dqf { "
f wtkpi "j g"ugcf { "ucv"r j cug"y j lej "eqwf "gzr nkp"j g"j ki j "tcv"qh"r gtegxgf "gzgtvqp0K"
j cu"dggp"uj qy p"j cv'e{enkpi "hqt"; 2"o kpwgu"cv"o qf gtcv"vq"j ki j "kpvgpuk { "rgf "vq"i n{eqi gp"
f gr ngvqp"*Dwtng"4224+0Vj gtghqtg."j g"ghgev"qh"37" "f hgtgpeg"kp"ectdqj { ftcv"kpvcng"
y qwf "pqv"dg"ecr wvgf "f wtkpi "j g"vko g"tkcn"cu"i n{eqi gp"y qwf "j cxi"dgdp" f gr ngvf "qp"j g"
r tgxkwu"uci g0Vj g"r tqvqeqn"y cu"rcvt"tgr megf "d { "c"vko g"vq"gzj cwukqp"vuv"y j lej "r tqxkf g"
eqpvtqn"qxgt"j g"gzgtekug"kpvgpuk { "cpf "gpj cpegf "j g"cdk { "vq"o gcwtg"r j { ukqmi kcn"
tgur qpugu"wpkilhvi wgo"

"



Hki wtg"7(80Qxgtxkgy "qh'yj g"gzr gtlo gpvni'cpf 'lco kktkucvqp'tlcnu'r tqvqeqr0'

"

"

Ugxgtcn' kgo u" qh' gs wkr o gpv' y gtg" cuuguuf " f wtkpi " r tg/vgukpi " kp" qtf gt" vq" gpj cpeg" tgrkcdlrv{" cpf " rtgekukqp" qh' yj g" tguwnu0' J go qewg" I nweug" 423- " *J go qewg" CD." £ pi grj qm . "Uy gf gp+" cpf "Ncecvg"Rtq" *Ctntc{ "MF M'Eqtr qtcvqp." Uj ki c. "lcr cp+" y gtg" tgr ncegf "d{ "yj g"Cpcmqz" I O 9" cpcn{ ugt "Cpcmqz" kputwo gpw. "J co o gtuo kj . "WM" y j lej "ku" eqpukf gtgf "o qtg" tgrkcdrg" yj cp" yj g" hqto gt" y q" o cej kpgu" vq" o gcwtg" dnqf "ncecvg" cpf " i nweug" eqpegpvcvqp" *xcp" Uqo gtgp" gv'cr0'4227= Gf y ctf u" gv'cr0'4225+0' Vj g" EX' "qh'yj g" Cpcmqz" I O 9" qdvclpgf "chgt" kpgpukxg" r tceveg" y cu"20' "hqt" dnqf "i nweug" cpf "20' "hqt" dnqf "ncecvg0' Eqmgevqp" dci u" y gtg" wugf "vq" o gcwtg" Q4" cpf "EQ4" eqpegpvcvqp" kp" yj g" gzr ktgf "ct" qh' r ctvlekr cpw" kp" qtf gt" vq" f gvto kpg" yj g" tgr kcvqt { "gzej cpi g" tcvkq " *TGT+ " y j lej "ku" c" ugpuklxg" r ctco gvg" yj cv'tgs wktgu" j ki j gt" r tgekukqp0' Vj gtghgtg. "yj g" EX' "qh'i cu" eqmgevqp" hqt "yj g" gzr ktgf "ct" eqmgevqp" r tqegf wtg" y cu" f gvto kpgf "d{ "hmkpi "vgp" eqmgevqp" dci u" y kj " npqy p" xqmw g" cpf " EQ4" eqpegpvcvqp" wukpi " c" tgr kcvqt { " i cu" uko wrcvt " *Xcewo gtleu" kpe. "Ecrkhtpk. "WUC+0' Vj ku" i gpgtcvgf "c" EX' "qh'30' 0' Qp" yj g" qvj gt" j cpf . " dtgcvj /d{ /dtgcvj "vgj pls wg" hqt "i cu" cpcn{ uku" y cu" wugf "kpungcf "qh' eqmgevqp" dci u" o gyj qf "vq" f gvto kpg" XQ4o cz" y kj "i qqf "r tgekukqp" cpf "o qtg" r tcevecrkv{ 0"

"

"

5.3.3 Experimental overview

Rctvlekr cpw'xkukgf "j g'ncdqtcvqt { "qp'ulz "f khtgpn'qecucuppu"cpf "eqo r ngvgf "j g'hqmqy kpi "vguv'ugs wgepg<"

3+"Rtgrko kpct { "vguv"

4+"Hco kktckucvqp"vkn'

5+"Htuv'i n'eqi gp"f gr ngvqp"r tqvqeqn'

6+"Htuv'gzi gtlo gpvni'vkn'

7+"Ugeqpf "i n'eqi gp"f gr ngvqp"r tqvqeqn'

8+"Ugeqpf "gzi gtlo gpvni'vkn'

Vj g"vko g"ugr ctcvki "j g'r tgrko kpct { "vguv'htqo "j g'hco kktckucvqp"vkn'y cu'c'o kpo wo "qh" 6: "j qwtu"cpf "j g'hco kktckucvqp"vguv'htqo "j g'huv'i n'eqi gp"f gr ngvqp"r tqvqeqn'd { "cv'rgcuv" 94"j qwtu0Vj g'i n'eqi gp"f gr ngvqp"r tqvqeqn'cpf "j g'gzi gtlo gpvni'vkn'y gtg"eqo r ngvgf "qp" eqpugewkxg"f c { u"cpf "c" o kpo wo "qh"ugxgp"f c { u"ugr ctcvgf "j g"vy q" gzi gtlo gpvni'vkn'u" *y cuj qw'r gkqf +0'kpc"etquuxgt"f guki p."r ctvlekr cpw"y gtg"tcpf qo n' "cuuki pgf "v"qpq"qh" vy q" gpgti { "o cvej gf "fkgu"y kj "c" 37' "f khtgpeg"kp"ectdqj { ftcvg"vulpi "c" eqo r wgt/ i gpgtcvgf "rkuv'qh'tcpf qo "pwo dgtu"O letquqhv"Gzegn"tgfo qpf."Y cuj kpi vqp."WUC+0'Chgt" j g"eqo r ngvqp"qh"j g'i n'eqi gp"f gr ngvqp"r tqvqeqn"r ctvlekr cpw"tgegkxgf "r tg/r cenci gf " o gcu"y j lej "j g {"y gtg"cong"v"eqpuwo g"dghqtg"tgwtplpi "v"j g'ncd"pgzv'o qtplpi "v" eqo r ngvg"j g'gzi gtlo gpvni'vkn'f

"

5.3.4 Preliminary test

Rctvlekr cpw'cttkxgf "cv"j g'ncdqtcvqt { "hqt"j g'r tgrko kpct { "vguv'chgt"hcuvkpi "hqt"j g'r tgrkqwu" j tgg"j qwtu"cpf "j cxkpi "cxqkf gf "echgkpg"kpvcng"ht"cv'rgcuv"32"j qwtu0Cffklqpcmf."j g {" y gtg"cong"v"cxqkf "creqj qn'cpf "v"tghtckp"htqo "cp { "utgpwqwu"r j { ulecn'cevkkv"ht"j g" r tgeg"lpi "46"j qwtu0Rctvlekr cpw"y gtg"j gp"y gki j gf "v"20"ni "pgct"r tgekukqp"kp"nki j v' enqj kpi "cpf "dctghqqv"vulpi "c" ecnkdtcvgf "grgestqple"uecng"Vcpkc"WM'Nf0" [lgy ung { ." O kff nguzg."WMH0J gki j v'y cu'o gcuwtgf "y kj qw'uj qgu'y kj "cp"ceewtce { "qh"20"eo "vulpi "c"

uvcfkqo gvgt "Ugec" Nf 0 "Dkto kpi j co . "WM40P gzv" r ctvlekr cpw" eqo r ngvgf "cp" kpetgo gpvcn' uvr " vguv" vq" xqrkqpcn' gzj cwukqp" qp" c" e{enkpi " gti qo gvgt" *Gzeckdw." Nqf g." Vj g" P gj gtrcpf u+"vq" f gvgto kpg"vj gk "XQ4o cz "cpf "hewcvg"vj tguj qrf 0Vj g"y qtnmqcf "uvcv" "cv"; 2" Y cw"Y "+"cpf "r tqi tguukxgn{ "kpetgcugf "d{ "52"Y "gxgt { "6"o kpwgu"wpkn'gzj cwukqp 0Gzr ktgf " ckt" y cu" cpcn{ ugf " wukpi " cp" cwqo cvgf " i cu" cpcn{uku" u{uvg " "O gvcn{ | gt " 5D." Eqtvgz. " I gto cp { -0Vj ku"vguv"y cu" wugf "vq" gpuwtg" uwdlgevu"o gv"vj g"uwf { "gpvt { "etkgtkc" hqt "cgtqdle" r qy gt "cpf "vq" f gvgto kpg"vj g" kpf kxkf wcn'y qtnm'cvg" hqt "wug" f wtkpi "vj g" i n{eqi gp "f gr ngvqp" r tqvqeqn'cpf "vj g"gzr gtko gpvcn'tkcr0'

5.3.5 Familiarisation session

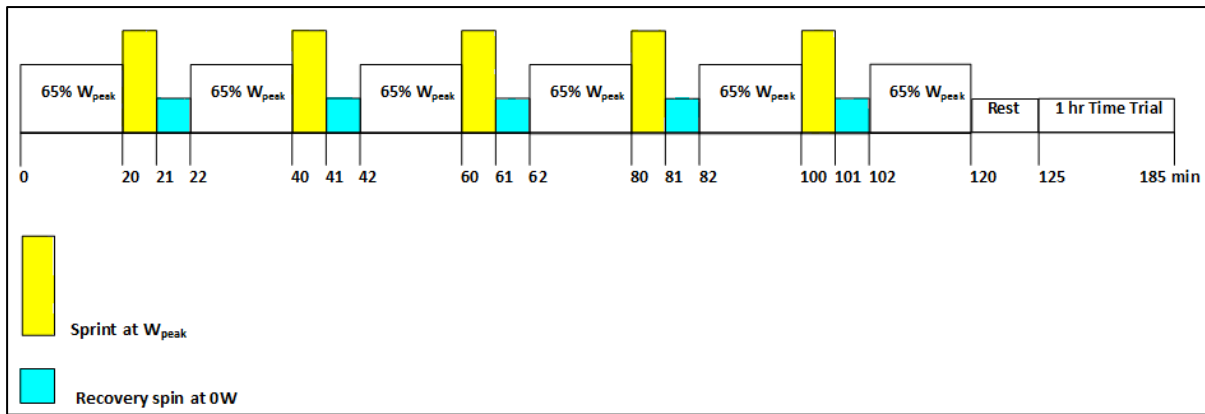
Rctvlekr cpw"r gthqto gf "c"vko g"vq"gzj cwukqp"vguv"vq" hco krlctkug"vj go ugrxgu"y kj "vj g"vcun' f guetkdgf "kp" ugevqp" 7000' Vj ku" uguukqp" y cu" cnuq" wugf "vq" xgtkh{ "vj g" e{enkpi "kpvpuv{ " r tguetkr vqp"qh'92' "qh"XQ4o cz 0'

"

5.3.6 Glycogen depletion protocol

Uwdlgevu" tgr qtvf "vq"vj g"mdqtcvqt { "cv": <22" c0 0' *0'3"j qwt "+" chgt "qxgtplj j v' hcuwpi "cpf " j cxkpi "tghctkpgf "htqo "utgpwqu"r j { ulecn'cevkv{ . "creqj qn'cpf "echhgkpg"kp"vj g" r tgxkqu"46" j qwtu 0C m' r ctvlekr cpw" tgr qtvf "vcnki "c"tguv'f c { "dghqtg"vj ku' r tqvqeqn' 0Vj ku' r tqvqeqn' cko gf " vq" uvcpf ctf kug" i n{eqi gp "uvtgu"kp"vj g" dqf { "r tkqt "vq"vj g" eqpuwo r vqp"qh"vj g" r tg/r cenxi gf " o gcn' dcugf "qp"vj g" cr r tqcej "f guetkdgf "kp" Tcwej "et al 0*4227 "+"cpf "r tgugpvf "kp" Hki wtg" 7040' Dtlghn{ . "r ctvlekr cpw" e{engf "hqt"vy q"j qwtu"cv"87' "qh"vj g"j ki j guv"y cwci g" qdvclpgf "f wtkpi " vj g"XQ4o cz "vguv" *Y r gcm" kpvgtur gtugf "y kj "hxg"82" ugeqpf u"ur tlpw"cv"Y r gcm'cv"o kpwgu" 42."62."82." : 2."cpf "322" hqmjy gf "d{ "3"o kpwg"tgeqxgt { "ur kp"cv"2"Y 0Vj gug"ur tlpw"cko gf "vq" f gr ngvgf "i n{eqi gp "kp"v{ r g"4"o wuerg" hkdugu 0Vj gtgchgt. "e{enkpi"eqo r ngvgf "c"qpg"j qwt"vko g" vkr0' Uwdlgevu" kpi guvgf "822"o n'qh'c"32' "i nwequg"r qn{ o gt" uqnwkp"r gt"j qwt"kp"vj g" htu'vy q" j qwtu"kp" qtf gt "vq" r tggp"vj { r qi n{ecgo kc 0Vj gtgchgt. "ad libitum" y cvgt "kpveng"y cu"cmjy gf " f wtkpi "vj g"qpg"j qwt"vko g"vkr0'

"



Hli wtg'7040Qxgtxkgy "qh"vj g"i n(eqi gp"f gr ngvqp"r tqvqeqn'

"

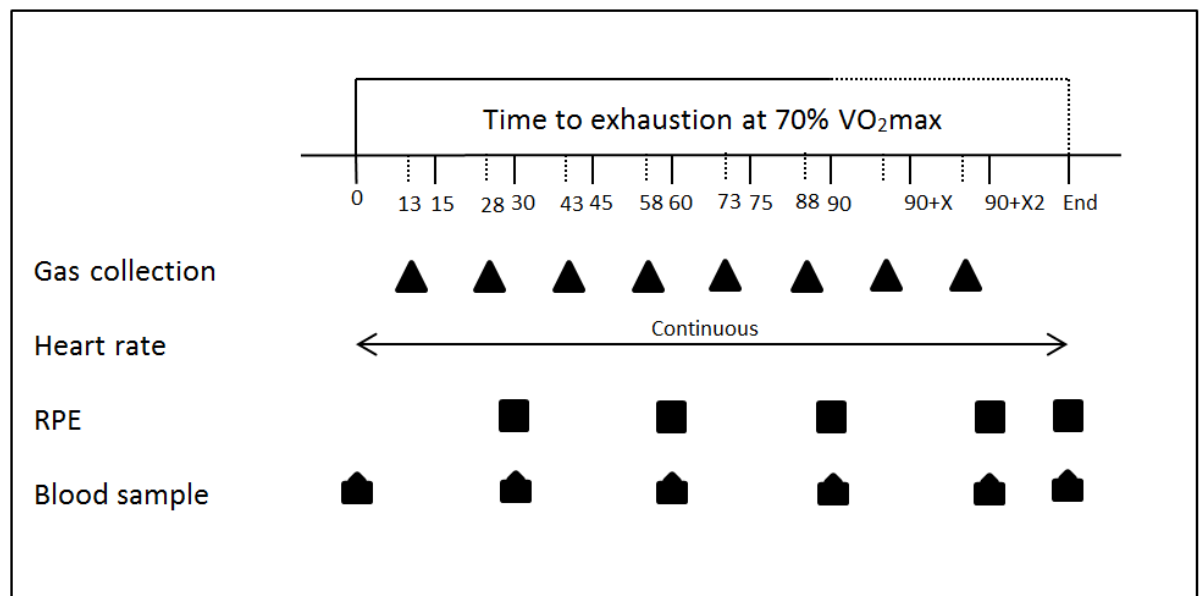
5.3.7 Experimental trial

Vy gpv{/hqw"j qwtu"chgt"vj g"i n(eqi gp"f gr ngvqp"r tqvqeqn' "0'9-22" c0 0'vq"; 22" c0 0: " r ctvlekr cpw"tgr qtvgf "vq"vj g"ncdqtcvqt { "j cxkpi "hcuvgf "ukpeg"vj g"eqpuwo r vqp"qh"vj gk"rcuv" o gcn"vj g"f c{ "dghqtg"cv": 22" r 0 0' 3"j qwt"cpf "cxqkf gf" cp{ "r j {ulecn'cevkk{0' Vj g" gzt gtlo gpvcn'vlecn'eqpukvgf "qh"uvgef { "ucvg"e{enpi "cv'92' "qh"XQ4o cz"wpvki"gzj cwukqp0' Vj g"qxgtxkgy "qh"vj g"gzr gtlo gpv"ku"hwpf "kp"Hli wtg'7050'F wtkpi "vj g"vguv"pq"gzvgtpcn' kphqto cvkqp"y cu"cxckrdng"vq"r ctvlekr cpw"*g0 0'f kucpeg."vko g"qt"j gctv'tcvg+"gzegr v'hqt" r gf cn'tcvg0'Rctvlekr cpw"y gtg"vqrf "vj cv'cm'rj { ukqmi lecn'o gcuwtgu'y km'dg"vcngp"tcpf qo n{ " f wtkpi "vj g"vlecn'0'Qpg"qt"vy q"hcng"o gcuwtgu'y gtg"vcngp"tcpf qo n{ "f wtkpi "vj g"gzr gtlo gpv"kp" qtf gt"pqv"vq"i kxg"cp{ "enwgu"cdqww"vko g"grcr ugf "vq"r ctvlekr cpw0' Hqt"gzco r ng."uqo g" r ctvlekr cpw"o ki j v' eqo r ctg"vj g" pwo dgt"qh"o gcuwtgo gpw"vcngp" f wtkpi "vj g"vguv"cpf " eqo r ctg"kv"vj g"r tgxkqwu"vlecn'0'Rctvlekr cpw"y gtg"pqv'cmqy gf "vq"nucgp"vq"o wuke"qt"y cvej " xkf gqu'f wtkpi "vj g"vgu0'Vj g{ "y gtg"y ctpgf "y j gp"vj g"r gf cnkpi "tcvg"ftqr r gf "dgmqy "82"tr o " cpf "vj g"vguv"y cu"vgtto kpcvgf "y j gp"vj g{ "eqwrf "pqv'kpetgcug"kv"cdqwg"82"tr o "y kj kp"32" ugeqpf u"qh" c"y ctpkpi 0' Vj g"vko g"ltqo "vj g"uactv"qh"vj g"gzr gtlo gpv"wpvki"vj g"r qkp"qh" gzj cwukqp."gzr tguugf "kp"o kpwgu"cpf "ugeqpf u."y cu"vj g"o gcuwtg"qh"gpf wtcpeg"ecr cekv{0' Rctvlekr cpw"y gtg"pqv'i kxgp"cp{ "hggf dcen'chgt"vj g"gpf "qh"vj g"vlecn'kp"qtf gt"pqv"vq"chge'vj g" r gthqto cpeg"qh"vj g" hqmgy kpi "vlecn'0' Rctvlekr cpw"tgegkxgf "vj gk" XQ4o cz" cpf "vko g"vq" gzj cwukqp"xcnwgu'y j gp"cm'vj g"vlecn'y gtg"eqo r ngvgf 0'

Vy q"o kpwg"gzr ktgf "ck"eqmgevqpu"wukpi "eqmgevqpu"dcu u'y gtg"qdvckpgf "gxgt { "37"o kpwgu" uctvlepi "cv'o kpwg"35"wpvki"vj g"gpf "qh"vj g"vgu0'Vj ku'gpcdrf "wu"vq"eqo r ngvg"i cu"eqmgevqpu" dghqtg"vj g"dmqf "uco r ng"o gcuwtgo gpv0'Vj g"uk'g"qh'eqmgevqpu"dcu "y cu'ej qugp"ectghwm{ "hqt"

gcej "r ctvlek cpv"lp"qtf gt"vq"tgf weg"vj g"gttqt"cuuqekcvf "y kj "vj g"tgukf wcn"xqnwo g"qh'dci u0' kpf cf f kkp. 'r ctvlek cpv'õnwuj gf õ"vj g'dci "y kj "vj gkt"gzr ktf "ck"dgqgtg"vj g'uctv'qh'vj g'tkcn' d{"dtgcj kpi "lpukf g"vj g'dci "hqt"5/6"o kpwgu"lp"qtf gt"vq"tgf weg"vj g"eqpvc o kpcvkqp"qh'vj g" dci u"y kj "vj g"co dkgpv'ck"*J qr ngt"gv'cn0"4234-0'Qz {i gp"cpf "EQ4"eqpegpvcvkqpuy gtg" f gvgto kpgf "wulpi "c"i cu"cpn{ugt"*Ugtxqhgzz"O kpkO R."Ugtxqo gz."J qwuwqp."WUC+"cpf " ecrkdtcvf "wulpi "ecrkdtcvkp"i cugu0'Gzr ktf "xgpvkrcvqt {"xqnwo g"y cu"o gcuwtf "wulpi "c" J ctxctf "ft {"i cu"o gvgt"*J ctxctf "Crrctcwu."O cucej wugwu."WUC+0'Dmqf "i nweug"cpf " nrevvg"eqpegpvcvkqpuy gtg"o gcuwtf "cv'dcugrkpg"cpf "vj gp"gxgt {"52"o kpwgu"wpvkn'vj g"gpf " qh'vj g'vgu0'Dmqf "uco r ngu'y gtg"eqmgevgf "htqo "vj g'hpi gtvr "cpf "o kzgf "hqt"qpg"o kpwg"kp" ecr kmt {"wdgu0'Vj g"co qwpw'tgs vktgf "hqt"cpn{uku'y gtg"32"Un'qh'y j qrg'dmqf "hqt"i nweug" cpf "9" Un' hqt" nrevvg" cpf " y gtg" cpn{ugf " wulpi " cp" Cpcmqz" I O 9" cpn{ugt" *Cpcmqz" kputwo gpw."Nqpf qp."WM+0J gctv'tcvg"y cu"o gcuwtf "eqpvkpqwun {"vj tqwi j qw"vj g'vgu'xlc" vrgo gt {"*Rqrct"Grgetq"Q[."Mgo r grg."Hkprcpf +0'Rctvlek cpw"y gtg"cungf "vq"tcvg"vj gkt" r gteglxgf "gzgtvkqp"wulpi "vj g"8/"vq"42/r qkpV'Dqti "uecrg"gxgt {"52"o kpwgu"wpvkn'vj g"gpf "qh" vj g'vgu"*Dqti "3; : 4+0'

"



Hki wtg'700Qxgtxkgy "qh'vj g"gzr gtlo gpwn'cpf "hco kktkucvkqp"tknu'r tqveqr0

"

"

"

5.3.8 Dietary intervention

Ɓ" c" etquuxgt" f guki p." r ctvkr cpw" y gtg" tcpf qo n{ " cmqecvgf " vq" eqpuwo g" gkvj gt" c" f kv" eqpvckpki " 60" i 0ni " DO^{/3}" qh" ectdqj { f tcvg" *Nqy gtEctd+" qt" cp" gpgti { /o cvej gf" f kv" eqpvckpki " 706" i 0ni " DO^{/3}" qh" ectdqj { f tcvg" *J ki j gtEctd+0' Vj g" o gcp" gpgti { " cpf " o cetqpwtkgpv" kvwngu" qh" dqvj " f kvwt { " kvgtxgpkpu" ctg" r tgugpvgf " kv" Vcdng" 700' Vj g" cxgtci g" f kvgtgpeg" kv" ectdqj { f tcvg" kvwng" dgvy ggp" eqpf kvkpu" y cu" 72" i " *37' -0' Vj g" f kvu" y gtg" r tgr ctgf " ceeqtf kpi " vq" r ctvkr cpw" f ckn{ " gpgti { " tgs vkt go gpw" *Tqf tki wgl " gv" cñ0' 422; + " cpf " ceeqwpvgf " hqt " kvf kvf wcn" hqqf " r tghgtgpegu0' C " uco r ng" f kv" kv" r tqxkf gf " kv" Vcdng" 7040' Vj g" kvu" o gcn' y cu" eqpuwo gf " y kvj " cv' rguv" 472" o n' qh' y cvgt " 37" vq" 52" o kvwgu" chvg" vj g" gpf " qh" vj g" i n{ eqi gp" f gr kvkpv" vguv" *c" 33-22" c0 0: y j gtgcu" vj g" qvj gt" vy q" o gcn' y gtg" eqpuwo gf " cv' 7-22" r 0 0' *0' 3" j + " cpf " : 22" r 0 0' *0' 3" j + " f wtkpi " vj g" uco g" f c { 0' Rctvkr cpw" y gtg" kvutwvgf " vq" tgwtp" cp { " wpequwo gf " hqqf " vq" o gcuwtg" eqo r kvpeg" dghgtg" vj g { " y gtg" ergtgf " vq" uctv0' Vj g" cxgtci g" EX' " hqt " gpgti { " kvwng" dgvy ggp" tkcn' y cu" 20' 0'

"

"

Vcdng' 700' F kvv' eqo r qukkpv" qh' vj g" gzt gtko gpvnr' eqpf kvkpu" *P " ? " 32+ "

"	Nqy gtEctd""	J ki j gtEctd""
Gpgti { " *Mecn" "	5283' 0' 5: 6"	526: '0' 5; : "
Ectdqj { f tcvg" *i + "	548' 0' 57"	59; '0' 62"
Rtqvkvkpv" *i + "	336' 0' 34"	336' 0' 37"
Hcv" *i + "	35; '0' 53"	337' 0' 56"

O gcp" 0' UF; J ki j gtEctd < 706" i 0ni " DO^{/3}" qh" ectdqj { f tcvg" = Nqy gtEctd < 60" i 0ni " DO^{/3}" qh" ectdqj { f tcvg"

"

"

"

"

"

"

Vcdng'7040Uco r ng'T ki j gtEctd'f lgv'hqt'c': 6'mi 'uwdlgev'tcklpi '8'f c{u'r gt'y ggm'

	Hqqf "	Co qwpv'	
		J ki j gtEctd"	Nqy gtEctd"
O gcn'3"	Ej lengp'r cuw'ucrf "	5: 2'i "	5: 2'i "
"	"	"	"
O gcn'4"	Eqtphrcngu"	92'i "	92'i "
	Y j qrg'o km'	78: 'o n'	78: 'o n'
	Y j kg'dt gcf "	; ; 'i "	; ; 'i "
	Ej ggug"	322'i "	322'i "
	Dwwgt "	62'i "	65'i "
		"	
O gcn'5"	Rcuw"	388'i "	342'i "
	Vqo cvq'ucweg"	392'i "	392'i "
Upcemu"	Cr r ng"	3: 2'i "	2'i "
	Dcpnpc"	437'i "	382'i "
	O kz gf 'pwu"	92'i "	332'i "
Gpgti { 'necn"	"	5'6: 7"	5'6: 8"
Ectdqj { f tcv'xi +"	"	5; 4"	554"
Rtqvlp'xi +"	"	347"	348"
Hcv'xi +"	"	376"	39; "

"

"

5.3.9 Statistical analyses

Ucvkuecn'cpcn{ugu'y gtg'r gthqto gf "wulpi "URUU"x044"*DO "eqtr 0"Cto qpm"P [."WUC+0'
Cm' f cv" y gtg" cpcn{ugf " hqt" pqto crk{0' Cm' uco r ngu" y gtg" pqto cm{ " f kutkdwgf " cpf "
uwdugs wgpw{ "c'r ckt gf /uco r ng'r"vgu'y cu'wugf "vq"eqo r ctg"vj g'o gcp"vko g"vq"eqo r ngvqp"lp"
vj g"vy q"gzr gtlo gpvcn'vguu0'C" wy q/y c{ "CP QXC" hqt" tgr gcvgf "o gcuwtgu" hqmqy gf "d{ "
Dqphgttqpk'r quv'j qe'vguu'y gtg'wugf "vq"cuuguu'kpvgtcevkqp"dgwy ggp"vj g"vy q"eqpf kkpqu"cpf "
vko g'hqt"dmqf "necvg."dmqf "i nequg."TRG."cpf "TGT0'Cm'f cv"ctg"tgr qtvgf "cu'o gcpu'Ö'

UF 0Ucukuecni'uki p~~h~~lecepeg'y cu'ugv'cv'p >'0270Vj g'uco r ng'uk g'y cu'ej qugp"qp'yj g'dcuku"qh"
r t~~g~~xkqwu'uwf kgu"qh"c"uko k~~ct~~"pcwtg"*Dtgy gt"gv'cr0"3; : : =O wqkq"gv'cr0"3; ; 6="Tq~~n~~uej "gv"
cr0"4224=Xgpn~~et~~co cp"gv'cr0"4223+0'

"

5.4 Results

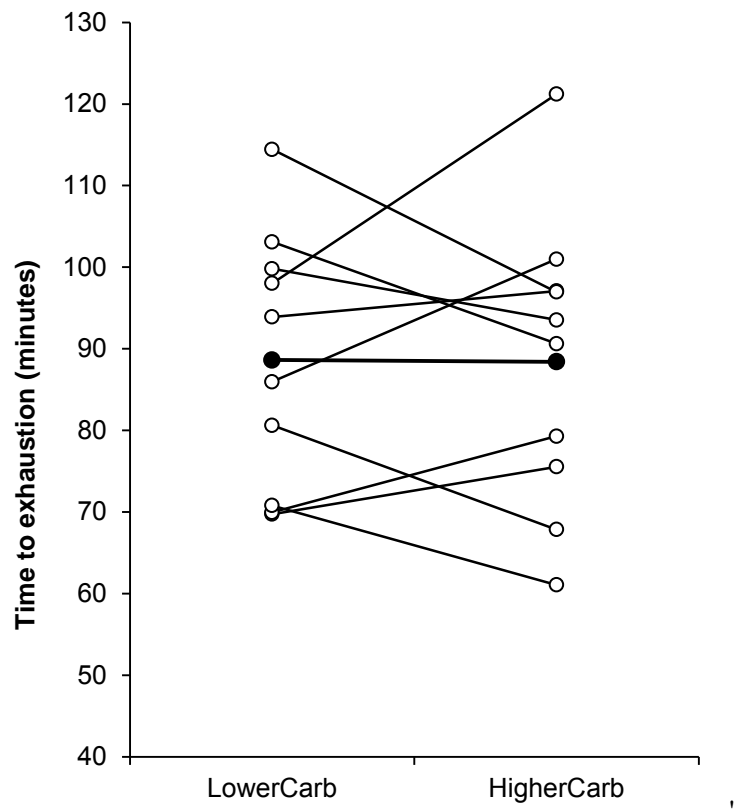
Vko g"vq"gzj cwukqp"cv'92' "XQ4o cz'y cu'pqv'uki p~~h~~lecpv{ "cngt~~gf~~"d{ "c"37' "f~~h~~gtgpeg"lp"
ectdqj { ftcv~~g~~"lpvcng"*Nqy gtEctd<: : 08"0̃'370"vs."J ki j gtEctd<: : 06"0̃'390"o kp~~w~~gu."p"? "
Q 8="Hki wtg"706+0'Kf k~~k~~f wcn'fcv"tgxgcngf "vj cv'hkxg"r ct~~v~~ekr cpv"ko r tqxgf"vj gk"vko g"vq"
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cv'dcug~~h~~pg."f wtkpi ."cpf "gzj cwukqp0Vj gtg'y gtg'pq'uki p~~h~~lecpv{f~~h~~gtgpegu"dgwy ggp"vj g"vy q"
eqpf k~~k~~qpu"cv' cp{ " vko g"r qkp0' Vj g"tcv~~kp~~i "qh"r gte~~g~~kxgf "gzgtv~~kp~~"*Vcdrg"705+"y cu"pqv"
uki p~~h~~lecpv{ "f~~h~~gtgpv'cv'cp{ "r qkp~~v~~"*p"@027+0'Vcdrg"706"uj qy u"vj g"TG~~T~~"cpf "J T"xcm~~w~~gu"
f wtkpi "vj g"ecrcek{ "vguv"dgwy ggp"Nqy gtEctd"cpf "J ki j gtEctd0'P q"uki p~~h~~lecpv'ej cpi gu"
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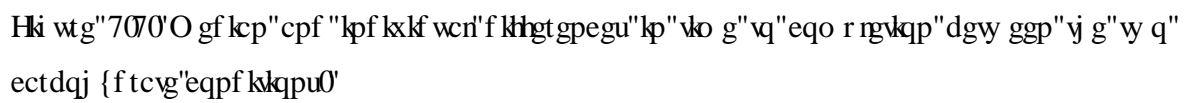
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Hi wtg"7060Rcktgf"fcv"qh'yj g'vko g'vq"gzj cwukqp"ht"gej "cvj ngv"dgwy ggp"Nqy gtEctd"cpf "

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Enugf "ektergu"tgr tgugpv"vj g'o gcp"vko g'vq"eqo r ngvqp"qh'yj g'i tqwr 0"



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Vcdmg'7000 gcp "8ÖUF +!r rruo c"revcg'cpf"i nvequg'eqpegrucvkpu'cpf"tcvg'qh'r gtekgf"gzgtvkqp"r wtkpi "gzgtelug'y j gp"
r tgegf gf"d{"gkij gt"Nqy gtEctd"qt"J ki j gtEctd"r kgy"

=		Nqy gtEctd"		J ki j gtEctd"	
=		T guv"	52"o kp"	82"o kp"	Gpf"
Ncevcg" *o o qirN ³ +	307"Ö304"	408"Ö308, "	406"Ö308, "	406"Ö20, "	404"Ö20, "
I nvequg" *o o qirN ³ +	50 "Ö206"	504"Ö208, "	502"Ö208, "	502"Ö20, "	505"Ö208
TRG"	"	38"Ö3"	3: "Ö4 ^Å "	3: "Ö3 ^Å "	38"Ö3"

, "p">"023"vs. "tguv=Äp">"027"vs. "tguv=Äp">"023"vs. "52"o kp=J ki j gtEctd<706"i 0ni "DO^{/3}"qh'ectdqj {ftcvg=Nqy gtEctd<60"
i 0ni "DO^{/3}"qh'ectdqj {ftcvg"

Vedrg7760O gop "ŒUF +t'gur ktcvqt {"gzej cpi g'tcwkj"cpf"} getvt'evg"f wtkpi "gzgtelug'y j gp'r'tgggf gf"d{ "gkxj gt'Nqy gtEctd"qt"
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Nqy gtEctd"
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37"o kp" 52"o kp" 67"o kp" 82"o kp" 37"o kp" 52"o kp" 67"o kp" 82"o kp"
J T" 362"Ö35" 363"Ö34" 365"Ö34, " 366"Ö35, " 359"Ö35" 35; 'Ö35" 363"Ö35" 365"Ö38"
*dl o kp+"
TGT" 2Q 4'Ö2Ø6" 2Q 3'Ö2Ø5" 2Q 3'Ö2Ø5" 2Q 2'Ö2Ø5" 2Q 3'Ö2Ø5" 2Q 3'Ö2Ø6" 2Q 2'Ö2Ø6" 2Q 3'Ö2Ø6"
, 'p">'Ø27'vs. "37"o kp=J ki j gtEctd<7Ø6"i ðri "DO ^{/3} "qh'Ectdqj {f'tevg=Nqy gtEctd<6Ø9"i ðri "DO ^{/3} "qh'Ectdqj {f'tevg"

5.5 Discussion

K'ku'i qqf "r tceveg"v"lphqto "r ctvekr cpw"v"tgr rdecv"v j gk "f lgv"htq "cv"ngcu"46/j qwtu"dghqtg" uctvpi "cp"gzr gtlo gpvnr tqegf wtg"lp"qtf gt "v"eqpvtqn'f kvct { "lpvcng0J qy gxgt."uwdlgeu" ecp"xct { "v j gk"gpgti { "cpf "o cetqpwtkgpv"lpvcngu"gxgp"y j gp"v j g { "ctg"lphqto gf "v"tgr rdecv" v j gk "46/j qwt "f lgv"*ugg"ugevqp"506+0'K'ku"v j gt ghqtg"ko r qvcpv"v"wpf gtuxcpf "v j g"ko r cev"qh" v j ku"xctkcvqp"qp"v j g"qweqo gu"qh"ct"tgugctej "uwwf { 0'Vj ku"uwwf { "gzco kpgf "v j g"ghgev"qh"ct" 37" " f lhtgpeg" lp" ectdqj { f tcvg" lpvcng" qp" gpf wtcepg" ecr cek { " cpf " r j { ukqni kecn' tgr qpugu0

Vj g"o clp"ej cmgpi g"qh"v j ku"uwwf { "y cu"v"tgf weg"v j g"co qwpv"qh"pqkug"htqo "cm"o gcuwgf " r ctco gvgtu"v"ct"o kpo wo "lp"qtf gt "v"lpetgcug"v j g"rknrgj qqf "qh"qdugt xpi "c"r quukdr"ghgev" qh"v j g"lgv"o cplr wv"vqp0Hqt"v j ku'tgcuqp."o cp { "o gcuwgu"y gtg"vcngp"dghqtg"v j g"uvtv"qh"v j g" uwwf { 0'Hqt"gzco r ng."qwt"tgugctej "i tqwr "eqpf wevgf "v j q'r kvv"uwwf lgu"v j cv'eqpvtkdwgf "v"v j g" f guki p"qh"v j g"gzr gtlo gpv"*ugg"ugevqp"70504+0'Eamgevqp"dcu u"lp"v j g"gzr gtlo gpvnr"tkcu" y gtg"wugf "kpuvgcf "qh"dtgcj /d { /dtgcj "vej pls wg"cu"kv"j cu"dggp"uj qy p"v"dg"ct"o qtg" tgrkdr"vej pls wg"*J qr ngt"gv"cn04234+0'Y g"ur gpv"o cp { "j qwtu"r tcevekp"qp"eqmgevqp" dcu u"lp"qtf gt "v"v j g"vgev"uki pcu"y kj "ceewtce { 0'Y g"wugf "v j g"tgeqo o gpf cvkqp"d { "J qr ngt" cpf "eqmgei wgu"*4234+"v"tgf weg"v j g"pqkug"lp"qwt "cpcn { uku"v"cu"mgy "cu"r quukdr0 Vj g" Cpcmz "I O 9" cpcn { ugt "y cu"wugf "v"o gcuwg"dmqf "i nveug"cpf "ncevg"eqpegpvtcvkpu" kpuvgcf "qh"v j g"j cpf j grf "o cej kpgu"y j kej "j cxg"dggp"uj qy p"v"j cxg"ngu"r tgekukqp"*xcp" Uqo gtgp"gv"cn04227+0'Cpqj gt"ej cmgpi g"y cu"v"o cmg"uwtg"v j cv'cm'r ctvekr cpw"tgej gf " v j g"72"i "37" +f lhtgpeg"lp"ectdqj { f tcvg"lpvcng0Vj ku"y cu"y j { "r ctvekr cpw"y gtg"i kxgp" r tg/r cen' gf "o gcnu"cpf "lphqto gf "v"tgwtp"cm'ngxqgtu"uq"v j g { "eqwf "dg"y gli j gf "dghqtg" v j g"tgugctej gt "f gekf gf "y j gyj gt "v"r wuvg"y kj "v j g"tkcn'qt "v"tgr gcv"v j g"lgv"0 K gcm { ."c" r gtewcpgqu"o wueng"dkqr u { "uj qwf "j cxg"dggp"r gthqto gf "v"o gcuwg"o wueng"i n { eqi gp" ngxnu"cv"v j g"gpf "qh"v j g"i n { eqi gp"f gr ngvqp"r tqveqn0J qy gxgt."v j gtg"ctg"o cp { "r tcevekn' f lhtewng"cuuqekvgf "y kj "v j ku"o gyj qf 0'Vj g"vej pls wg"tgs wkt gu"ur gekrkugf "gs wkr o gpv'cpf " gzr gtug0K"cf f kkp."f wg"v"ku"lpxcukxg"pcwtg."k"ecp"ecwug"f lueqo hqtv"lp"r ctvekr cpw" cpf " chgev" v j g"pwo dgt" qh"cyj ngvu"y knkpi "v"r ctvekr cvg" *F gpi ngt" gv"cn04236+0' Vj g" i n { eqi gp"f gr ngvqp"r tqveqn'wugf "lp"v j g"ewtgpv'uwwf { "ku"ct"tgrkdr"r tqegf wtg"v j cv'tguwngf " lp"uko kct"gpf "gzgtekug"o wueng"i n { eqi gp"ngxnu."lpf gr gpf gpv'qh"r tg/gzgtekug"ngxnu"*Tcwej " gv'cn04227+0

Cuuwo kpi "qwt"kpvgtxgpkqp"y cu"uweeguhwn"vj gtg"y cu"pq"tgcupq"vq"vj kpn"vj cv"uwldgeu" y qwf"fq"y qtug"qp"J ki j gtEctd"eqo r ctgf "vq"Nqy gtEctd0Gzgteklpi "wpk"gzj cwunkqp"cv" 92/97" "XQ4o cz"j cu"dgpp"uj qy p"vq"dg"nko ksf"d{"i n(eqi gp"cxckrdkrk{"*J gto cpugp"gv" cr0"3; 89="Mctnuqp"(" Ucnkp."3; 93+." kpf gr gpf gpw{"qh"dmqf"i nweug"eqpegrtckvpu" *Oâj nwo"(" "J gto cpugp"3; 9: +0Vj gtghqtg."c"72"i "kpetgcug"kp"ectdqj {f tcvg"kpvcng"uj qwf" gzvgpf"vko g"vq"eqo r ngvqp0Vj gtg"ku"cy gm/guxdrkuj gf "rkpgct"tgrvqp"dgvy ggp"i n(eqi gp" uqtci g"cpf"vko g"vq"gzj cwunkqp"cv"cp"kpvgpuk{"ç87" "XQ4o cz"i qmplem"gv"cr0"3; 96+0Uq"kh" y g"y gtg"vq"eqpukf gt"cy j {r qvj gvecn"uegpctkq"y j gtg"r ctvekr cpw"ctg"vguvf"kp"kf gcn" eqpf kkpqu."r ctvekr cpw"uj qwf"j cxg"gzvgpf gf"vj gk"vko g"vq"gzj cwunkqp"htqo": : "o kpwgu"kp" Nqy gtEctd"vq"323"o kpwgu"kp"J ki j gtEctd0J qy gxgt."qpg"qh"vj g"tgcuppu"y j {"kp"tgcny qtrf" gzr gtlo gpv"r ctvekr cpw"y kn"pqv"i gv"35"o kpwgu"ko r tqxgo gpw"ku"fwg"vq"vj g"fc{/vq/fc{" xctkdrk{"kp"gpf wtcepg"ecr cek{0Vj g"hxg"uwldgeu."kp"vj g"ewtgpv"uwf {"y j qug"gpf wtcepg" ecr cek{"y cu"tgf wegf"kp"J ki j gtEctd"o c{"dg"gzr nkpgef"d{"vj g"tgr tqf weklkrk{"qh"vj g"vko g" vq"gzj cwunkqp"vgu0"

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*J q r n k p u " g v " c r 0 " 4223+ v j g " s w c k v { " q h " u r g g r " v j g " p k i j v " d g h q t g " g c e j " v t k n " c p f " q v j g t " w p e q p v t q m c d r g " g p x k t q p o g p v c n l h c e v q t u 0 "

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k p " v j g " e w t t g p v " u w f { . " v j g " c x g t c i g " f k h g t g p e g " k p " v k o g " v q " e q o r r g v k q p " d g w y g g p " v j g " v y q " e q p f k k q p u " y c u " c " p q p / u k i p k h e c p v " x c n w g " q h " / 205 ' 0 ' V q " q w t " n p q y n g f i g . " p q " q p g " j c u " g x g t " e q p f w e v g f " c " u w f { " k p x g u k i c v k p i " v j g " g h g e v " q h " c " u o c m f f k h g t g p e g " k p " e c t d q j { f t c v g " k p v c n g " q p " g p f w t c p e g " r g t h q t o c p e g 0 [g v ' u q o g " u w f k g u " y g t g " h q w p f " v q " e q p v k p " c " e q p v t q n ' i t q w r " * g 0 ' t g e g k x k p i " c " e c t d q j { f t c v g " o c v e j g f " f k g v " u q " k v " e c p " d g " e q o r c t g f " v q " q v j g t " g z r g t k o g p v c n " i t q w r u " * D t g y g t " g v ' c r 0 " 3 ; : : = O w q l q " g v ' c r 0 " 3 ; ; 6 = T q m u e j " g v ' c r 0 " 4224 = X g p n e v t c o c p " g v ' c r 0 " 4223 + 0 ' V j g " f k h g t g p e g u " k p " v j g " e c t d q j { f t c v g " e q p v g p v " d g w y g g p " v j g " e q p v t q n ' c p f " k p v g t x g p v k q p " i t q w r u " k p " v j g u g " u w f k g u " y g t g " 4 " v q " 38 ' 0 ' U q o g " q h " v j g u g " u w f k g u " r q u u g u " o g v j q f q n q i k e c n " y g c n p g u u g u " k p " f k g v t { " u c p f c t f k u c v k p 0 H q t " g z c o r n g . " v q v c n ' g p g t i { " k p v c n g " y c u " p q v ' e q p v t q m g f " d g w y g g p " v j g " v y q " f k g v t { " k p v g t x g p v k q p u " c p f " x c t k g f " d { " c r r t q z k o c v g n { " 922 " n e c n " k p " v y q " q h " v j g u g " u w f k g u " * D t g y g t " g v ' c r 0 " 3 ; : : = O w q l q " g v ' c r 0 " 3 ; ; 6 + 0 ' V j k u " o c n g u " k v f k h k e w n " v q " f k u k p i v k u j " y j g v j g t " v j g " g h g e v " q d u g t x g f " y c u " f w g " v q " v j g " f k h g t g p e g " k p " e c t d q j { f t c v g " q t " v q v c n ' e c m t k e " k p v c n g 0 "

V j g " e n q u g u v " u w f { " v q " q w t " r t q v e q n " y c u " e q p f w e v g f " d { " D t g y g t " e t a l . " * 3 ; : : + 0 ' V j g " u w f { " e q o r c t g f " v j g " g h g e v " q h " v y q " e c t d q j { f t c v g " t k e j " f k g u " c p f " c p " g p g t i { " o c v e j " f k g v " y k j " 35 " " f k h g t g p e g " k p " e c t d q j { f t c v g " k p v c n g " q p " v t g c f o k m " t w p " v q " g z j c w u k q p " c v " 92 " " X Q 4 o c z " k p " j k i j n { " v t c k p g f " t w p p g t u 0 ' V j g " t g u g t e j g t u " t g r q t v g f " u k o k r c t " h k p f k p i u " v q " q w t u " f g o q p u t c v k p i " c " p q p / u c v k u k e c m { " u k i p k h e c p v " f k h g t g p e g " q h " 40 ' " c u " c " t g u w n " q h " c " 35 " " * 5 ; " i + f k h g t g p e g " k p " e c t d q j { f t c v g " k p v c n g " d g w y g g p " v t k n u 0 "

V j g " e w t t g p v " u w f { " f k f " p q v " h k p f " c p { " u k i p k h e c p v " f k h g t g p e g u " k p " d m q q f " n e w c v g " c p f " i n e q u g " e q p e g p v t c v k p u " d g w y g g p " v j g " v y q " f k g v t { " k p v g t x g p v k q p u 0 ' V j g " g z r g e v g f " f k h g t g p e g " k u " p g c t " v j g " r t g e k u k q p " q h " v j g " g s w k r o g p v " v { r k e c n " k p " u r q t v u " u e k g p e g " c p f " v j k u " e q w f " d g " v j g " t g c u q p " h q t " q w t " h c k m t g " v q " h k p f " u k i p k h e c p v " f k h g t g p e g u 0 ' D m q q f " n e w c v g " x c n w g u " x c t k g f " d g w y g g p " 40 " c p f " 40 " o o q r n ³ 0 ' V j g u g " x c n w g u " y g t g " g z r g e v g f " c u " v j g " o g c p " y q t n i t c v g " h q t " v j g " v k o g " v q " g z j c w u k q p " * 428 " Õ 52 " Y + " y c u " l w u v " c d q x g " v j g " n e w c v g " v j g t g u j q n f " q h " 40 " o o q r n ³ * 3 ; 3 Õ 63 " Y + 0 ' V j g u g " h k p f k p i u " c t g " k p " n k p g " y k j " v j q u g " q h " r t g x k q w u " u w f k g u " * Y k n k c o u " g v ' c r 0 " 3 ; ; 4 = T q m u e j " g v ' c r 0 " 4224 = O w q l q " g v ' c r 0 " 3 ; ; 6 + 0 ' V j g " c x g t c i g " n e w c v g " e q p e g p v t c v k p u " q d u g t x g f " f w t k p i " g z g t e k u g " k p " v j g " e w t t g p v " u w f { " y g t g " n q y g t " e q o r c t g f " v q " D t g y g t " e t a l . " * 3 ; : : + " y j q " w u g f " c " u k o k r c t " g z g t e k u g " k p v g p u k { 0 ' k p " v j g " e w t t g p v " u w f { . " e c t d q j { f t c v g " y c u " v j g " r t k o c t { " g p g t i { " u q w t e g " w u g f "

f wtkpi "vj g"uvgcf {/uvcg"uwo czko cni'gzgtelug"wpvki'gzj cwukqp"kp"dqvj "J ki j gtEctd"cpf "Nqy gtEctd"eqpf kkpupu"*TGT"x"20 2-0J qy gxgt."pq"uki pkkcpv'f khtgpegu'y gtg"hwpf"kp" TGT"dgy ggp"vj g"eqpf kkpupu'Uko kct"kp f kpi u'y gtg"qdvkpgf"d {"Tqmuej "cpf"eqmci wgu" *4224+"y j q"kp xguvki cvgf"vj g"ghgev"qh'38' "f khtgpeg"kp"ectdqj {f tcvg"kpvcng"qp" TGT" f wtkpi "c"62"o kpwg'uwo czko cni'vuv'cv'95' "XQ4o cz0Vj gug'tguwu'uggo "v"dg"eqpukugpv" y kj "qvj gt'tgugctej "*Y ktkco u'gv'cr03; ; 4=O vqlq'gv'cr03; ; 6-0"

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5.6 Conclusion

Vj g"o ckp"qweqo g"qh'vj ku'uwf {"y cu'vj cv'cv'c"i tqwr "ngxgn"c"37' "cxgtci g"f khtgpeg"kp" ectdqj {f tcvg" kpvcng" f kf "pqv' cngt" gpf wtcepg" r gthqto cpeg" qt" ugrgevgf " r j {ukqmi kcn' tgur qpug0J qy gxgt."cv'vj g"ngxgn'qh'vj g"kp f kxf wcn'uwdlgev."vj gtg"o c {"uvm'dg"c"r qvgpvkcn' ghgev'qh'ectdqj {f tcvg"kpvcng."dw'uwej "cp"ghgev'o c {"dg{qp f "vj g'vej plecn'r tgeklqp"qh'vj g" o gcuwgo gpw0'Hwtvj gto qtg."72' "qh'r ctvlekr cpvu'y j q"wugf "F_{tgecm}"vq"uvcpf ctf kug"f kgvct {" kpvcng"kp"vj g"uwf {"r tgugpvgf"kp"Ej cr vgt"5."j cf "c"rti gt"xctkcdkvw {"vj cp"37' 0Vj g"ko r cev' qh'c'f khtgpeg"kp"ectdqj {f tcvg"j ki j gt'vj cp"37' "cpf "uqy gt'vj cp'y j cv'j cxg'dggp'vugvf "j cu" {gv'q"dg'uwf kgf 0'

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Chapter 6

The effect of encouraging individuals to stay well-hydrated in the pre-trial preparation period on their hydration level"

6.1 Summary

O cp{ " tgugetej gtu" rdo kv" vj gk" r tgvtkcn" j { f tcvkp" utcvgi lgu" vq" uko r n{ " gpeqwtci kpi " r ctvlekr cpw'vq'unc{ 'y gmj { f tcvgf 'y kj qw'r tqxkf kpi "cp{ 'kpwtwevkppu'qp'j qy "vq'f q'uo0K'ku" ukm'pqv'npqy p'y j gvj gt"vj ku" gpeqwtci go gpv'ecp"dg'uueguuhw'lp"o kpk kuki "vj g'tkum'qh" uctvki "cp"gzgtekug'vuv'kp'c"j { r qj { f tcvgf "ucvg0Vj gtghqtg."vj g'o clp'cko "qh'vj ku'uwf { 'y cu" vq'o gcuwtg"vj g'lpkfg ppeg"qh'r ctvlekr cpw'y j q'y gtg"j { r qj { f tcvgf "qp"vj gk"cttkxcn'vq"vj g" rcdqtcvqt { " chgt"tgegkxkpi " gpeqwtci go gpv' vq"unc{ "y gmj { f tcvgf 0' Hqwtv{ /hkg" pqto cm{ " cevkg"qt"o qf gtcvgn{ "vclpfg"o gp"r tqxkf gf "c"htuv'o qtpkpi "wtkpg"uco r ng"cv"j qo g"uqpp" chgt"y cnkpi "wr 0'Crr tqzko gcn{ "qpg"j qwt"chgt."vj g{ "r tqxkf gf "c"ugeqpf "wtkpg"uco r ng"cv" vj g"rcdqtcvqt { 0'Rctvlekr cpw'y gtg"kpwtwevgf "vq'hu'v'qxgtpki j v'ht"32"j qwtu'htqo "cm'hqf " cpf "ftkpm"gzegr v'htqo "y cvgt."y j lej "vj g{ "y gtg"xgtdcm{ "gpeqwtci gf "vq'ftkpm'vq'unc{ "y gmj j { f tcvgf 0'Vj g'tguwu'lpf kcvgf "vj cv'57' "qh'r ctvlekr cpw'y gtg'uki plhkecpv{ "j { r qj { f tcvgf ." 52' "y gtg'rkng{ "j { r qj { f tcvgf ."cpf "57' "gvj { f tcvgf "qp"vj gk"cttkxcn'vq"vj g"rcdqtcvqt { 0' Hktuv'o qtpkpi "wtkpg"quo qnrkv{ "xcnvgu'y gtg"*o gcp"Ō'UF +<3265"Ō'32: .": 23"Ō'66."cpf "75: " Ō'329"o Quo qrfni ^{/3}."tgur gevkgxgn{ 0'Wtkpg"quo qnrkv{ "qh'vj g'htuv'xqkf "y cu'pqv'uki plhkecpv{ " f khgtgpv"dgw ggp"cvj ngvu"cpf "ppp/cvj ngvu"*9: 2"Ō'444"cpf ": 2: "Ō'473"o Quo qrfni ^{/3}." tgur gevkgxgn{ =p"? "Ō; +pqt"vj g"ugeqpf "xqkf"*: 47"Ō'3: 4"cpf ": 6; "Ō'457"o Quo qrfni ^{/3}." tgur gevkgxgn{ =p"? "Ō3+0'Vj gug'tguwu'lpf kcvgf "vj cv'gpeqwtci kpi "r ctvlekr cpw'vq'ftkpm'y cvgt" kp'vj g'r tgvtkcn'r tgr ctvlekr r gtqkf "ku'pqv'gpqwi j "vq'cej kxg"gvj { f tcvkp"kp'cm'uwdlgeu0

"

6.2 Introduction

Vj g"ghge'v'qh"j { r qj { f tcvkp"*vto u"fhkpgf "kp"Vcdng"804+"qp"gpv'wtcpeg"r gthqto cpeg"ku" y kf gn{ "npqy p"cpf "gzvpuvkgxgn{ "uwf kgf "Ucy n{ "gv'cr04229+0'K'j cu'dggp"f go qpwtcvgf "vj cv" y cvgt"nqu"qh'o qtg"vj cp"4' "qh'DO "ecp"fk kpkuj "cgtqdk"r gthqto cpeg"kp'vgo r gtcvg."y cto " cpf "j qv'gpvktqpo gpw'*Ej gwxtpv'gv'cr04225=Cto utqpi "gv'cr03; : 7=Mepghem'gv'cr04232=Ej gwxtpv'gv'cr04227=Ej gwxtpv'Mepghem"gv'cr04232+0'Hq"gzco r ng."Ej gwxtpv'et al." *4227+"gzco kpgf "vj g"ghge'v'qh"j { r qj { f tcvkp"qp"gpv'wtcpeg"r gthqto cpeg"kp"vgo r gtcvg" gpvktqpo gpv0'Rctvlekr cpw'y gtg"r cuvkgxgn{ "j { r qj { f tcvgf "d{ "ukvki "kp"vq'v'qo "67ÅE+" hqt"5"j qwtu'kp'vj g'o qtpkpi "y kj "qt"y kj qw'hwkf "tgr nrego gpv0'Vj g'htqto gt"eqpf kkp"ngf "vq" y gli j v'o clpvgpcpeg."y j gtgcu"vj g'rwgt"eqpf kkp"ngf "vq"v'c"5' "nqu"qh'DO 0'Vj gp."kp"vj g" chgtppqp."uwdlgeu"gzgtekugf "ht"52"o kpwgu"cv'72' "XQ4r gcm'qp"v'e{enkpi "gti qo gvgt"

hqmjy gf "d{ "c"52"o kpwg"ko g"tlen0Vj g"tgugctej gtu"hwpf "vj cv"ko g"tlen'r gthqto cpeg'y cu"
 uki phkecpw{ " fgetgcugf " d{ " ø " : ' " y j kg" j {r qj {f tcvkp" eqo rctgf " vq" gwj {f tcvkp0"
 Vj gtghqtg." j {r qj {f tcvkp"uj qwf "dg"eqpvtqmgf "hqt"kp"uwf { "rtqveqni"cpf "tgugctej gtu"
 uj qwf "o cng"uwg"vj cv'r ctvekr cpw"ctg"uctvpi "gcej "gZR gtlo gpvcn'tken'kp" c"gwj {f tcvgf "
 uvcg"vq"cxqkf "pqkug'lp"vj gkt "tguwu0"

Tgugctej gtu"ecppqv'tgn{ "qp"r ctvekr cpw"vq"wt p"wr "vq"gzr gtlo gpvcn'tken'y gm/j {f tcvgf "h"
 vj g{ "f q"pqv"rtqxkf g"erget" kputwekqpu" vj cv"uj qwf "dg" hqmjy gf "f wtkpi " vj g"rtg/tken'
 rtgrctevkp"r gtlqf 0Uj ktghu"cpf "O cwi j cp"*3; ; : + "cpn{ugf "vj g"fc{ /vq/fc{ "xctcdkx{ "kp"
 j {f tcvkp"ngxnu"ht "hkg"eqpugewkxg"fc{ u'lp"33"ugf gpvt { "lpf kxkf wcn'y kj qw'tgutvlekp " "
 vj gkt "f lgvct{ " kpcng" qt" fcn{ " rj {ulecn' cevxxk{0' Vj g" tgugctej gtu" uj qy gf " vj cv" wtkpg"
 quo qncx{ "WQuo + "qh"vj g"htuv'o qtpkpi "xkf "xctkf "dgw ggp"64; "cpf "3236"o Quo qrfni ^{/3}
 y kj kp/uwdlgeu= " y j gtgcu." dgw ggp/uwdlgeu" xctcdkx{ " y cu" dgw ggp" 453" cpf " 3379"
 o Quo qrfni ^{/3}0' Uj ktghu" cpf " O cwi j cp" cnxq" tngxcrf " vj cv" 72' " qh" uwdlgeu" y gtg"
 uki phkecpw{ "j {r qj {f tcvgf " * @ ; 22"o Quo qrfni ^{/3} + "qp"cv'ngcu"qpg"qh"vj g"hkg"vgukpi "f c{ u0'
 Vj ku" f go qpuctvgu"vj cv'h"uwdlgeu"ctg"ngh"y kj "pq"j {f tcvkp"uctvgi { . "vj g{ "o ki j v'dgi kp"
 vgukpi "j {r qj {f tcvgf 0"

K'j cu"dgpp" f go qpuctvgf " vj cv"j {r qj {f tcvkp"ku"o qtg"eqo o qp"co qpi u'v'ngvu" vj cp"
 rtgxkqwn{ "vj qwi j 0'Hqt"gzco r ng."Rj knk u"et al."*4236+"o gcuwtgf "wtkpg"ur gekhe"i tckx{ "
 *ew/qhh"xcnw"wgf "hqt"j {r qj {f tcvkp" @3042"y j kej "gs wcv"vq" @922"o Quo qrfni ^{/3} + "qh"
 vj kvggp"grkg"Gwtqr gcp" { qwj "uqeegt"r nc{gtu"d{ "eqngevpi "vj gkt "htuv'o qtpkpi "wtkpg"xkf "
 hqt"vj tgg"eqpugewkxg"vclpki "f c{ u0'Vj g"tgugctej gtu"tgr qtvgf "vj cv"99' "qh"v'ngvu"y gtg"
 rkngn{ "j {r qj {f tcvgf "qp"fc{ "3"cpf "5."y j gtgcu"84' "y gtg"rkngn{ "j {r qj {f tcvgf "qp"fc{ "40"

Xqrr g"et al."*422; + "eqpf wevgf "c"uwf { "uko knct"vq"Rj knk u"cpf "eqngci wgu"dw"qp" c"rti gt"
 uecrg"lpenw'kpi "485"o cng"cpf "hgo cng"uwf gpv'v'ngvu0Xqrr g"cpf "eqngci wgu"eqngevgf "qpg"
 ur qpvcpgqwn{ "xkf gf "wtkpg"uco r ng"dghqtg"vclpki "cpf "cuuguvgf "wtkpg"ur gekhe"i tckx{ "cpf "
 tgr qtvgf "vj cv"88' "qh"v'ngvu"y gtg"rkngn{ "j {r qj {f tcvgf "dghqtg"vclpki " *ew/qhh" @3042+0'
 K'uj qwf "dg"pqvgf " vj cv'k'j cu"dgpp" uwi i guvgf " vj cv" wtkpg"uco r ngu"cnpg"ur qpvcpgqwn{ "
 uj qwf "pqv'dg"wgf "vq"cuugu"j {f tcvkp"ngxnu"cu"kv"eqwf "dg"chgevgf "d{ "hmkf "kpcng."f lgv."
 cpf "gzgtekgf" f wtkpi "vj g"fc{ " *Ej gwxtqp'v'cn'04237+0'Hktuv'o qtpkpi "wtkpg"xkf "j cu"dgpp"
 uj qy p"vq"dg" c"dgwgt"lpf lecvqt"qh"WQuo "gur gekcm{ "cu"ku"vj tguj qrf u"j cxg"crtgcf { "dgpp"
 xcrlf cvgf " *Cto utqpi "gv'cn'03; ; : = "Rqr qy unk"gv'cn'04223= Uj ktghu" ("O cwi j cp"3; ; : +0'
 J qy gxgt."vq"qwt"npqy rgi g." vj gtg"ctg"ukn'pq"erget"i wkf grkpgu"qp"y j gvj gt "vj gtg"ku" c"

uki p~~h~~lecpv'f~~h~~htgpeg"dgy ggp"vj g"htu'cpf "ugeqpf "wt~~h~~pg"xqkf 0'Vj g"ugeqpf "o qtpkpi "xqkf "ecp"dg"r tcevecln'gur gekm{ "h"vj g"gzr gtlo gpv'ku"pqv'qp" gctn{ "o qtpkpi "Cto utqpi "gv'cnf 3; ; 6+0'

C"eqpukf gtcdrng"pwo dgt"qh'tgugctej "uwf lgu"f q"pqv'ko r ngo gpv'cp{ "j { f tcvkqp"utcvgi { "pqt" ej gem'vj g"j { f tcvkqp"ucwu"qh'r ctvekr cpwu'r tkqt "vq"vj g"gzr gtlo gpv'*Eco r dgm'gv'cnf 422: =" Tqm"gv'cnf 422: ="O qpecf c/Iko gpgl "gv'cnf 422; ="Dggngp"gv'cnf 422; ="Ur gpeg"gv'cnf 4235=" Rgugtkeq" ("O cej cf q"4236+0' Uqo g"qh"vj gug"uwf lgu"rko k'vj gk"kpuxtwekqpu"vq"uko r n{ "gpeqwtci kpi "r ctvekr cpwu"vq"uvc{ "y gm'j { f tcvgf "46/j qwtu'dghqtg"gxgt{ "tkcn'y kj qw'i kxkpi "engct"kpuxtwekqpu"qp"j qy "vq"cej kxg"kv'Eco r dgm'gv'cnf 422: ="Rgugtkeq" ("O cej cf q"4236+0' Vj g"gpeqwtci go gpv'o c{ "tguwn'lp'r ctvekr cpwu"vq"uvtv'lp"xct{ kpi "ucvqu"qh'j { f tcvkqp"cetquu" o wmr rg"vgu"qeecukqpu 0'Vj g{ "o ki j v'dg"y gm'j { f tcvgf "qp"qpg"qeecukqp"cpf "j { r qj { f tcvgf "qp"cpqyj gt 0'Cu"ceqpugs wpeg. "tgugctej gtu"o c{ "hcn'vq"hp{ "uki p~~h~~lecpv'ghgevu"cuuqekcvgf " y kj "vj g"lpvgtxgpvkqp"f wgv"vq"vj g"pqkug"lpvtqf wegf "d{ "j { r qj { f tcvgf "r ctvekr cpwu 0'J qy gxgt." k'ku'ukm'pqv'npqy p"vq"y j cv'gz vgpv'gpeqwtci go gpw'ecp"chgevj { f tcvkqp"ucwu 0'Vj gtghqtg." vj g"o clp"clo "qh"vj ku"uwf { "y cu"vq"o gcuwg"vj g"kekf gpeg"qh'r ctvekr cpwu"y j q"y gtg" j { r qj { f tcvgf "qp"vj gk"cttkcn"vq"vj g"ndqtcvqt{ "chgt"tgegkxkpi "gpeqwtci go gpv"vq"uvc{ " y gm'j { f tcvgf 0' Vj g"ugeqpf ct{ "clo u"y gtg"vq"eqo r ctg" WQuo "qh'cvj ngvu"versus"pqp/ cvj ngvu"cpf "htu'versus"ugeqpf "o qtpkpi "xqkf 0'

"

6.3 Materials and methods

6.3.1 Participants

Hqtv{/hxxg" ugf gpvct{ " qt" o qf gtcvgn{ " vclp~~h~~gf " o gp" r ctvekr cvgf " kp" vj g" r tgugpv' uwf { 0' Tgetwko gpv'qh'r ctvekr cpwu"y cu"o cf g"vj tqwi j "r quvgtu'r nregf "ctqwpf "eco r wu'cv"Qzhqtf " Dtqqngu"Wpkxgtuk{ 0'Vj g'r j { ulecn'ej ctcevgtku~~h~~eu"qh'vj g'r ctvekr cpwu'ctg'r tgugpv'gf "lp"Vcdng" 800'Grki kdkv{ "etkgtk"lpenw gf "o gp"ci gf "dgy ggp"3: /62" { gctu"cpf "htgg"qh'o gvcdrke" f kuqtf gtu"*g 0'f kcdgvu."ectf kqxcuewrt" f kugcug."qt"j { r gtvgpukqp+0'Rctvekr cpwu"y gtg"pqv' vqrf "cdqww"vj g'tgcn'clo "qh'vj g'uwf { "cpf "vj cv'vj gk"eqo r ncepg"y cu'dgkpi "o qpkaqtgf "vq"r tg/ vgu"gpeqwtci go gpv 0'Vj g"clo "qh"vj g"f gegr vkqp"y cu"vq"r tggxgpv'uwdlgevu"htqo "o qf kh{kpi " vj gk"dgj cxkwt"*g 0'f tlpn'ic"rti g"s wcpvkv{ "qh'hmkv"qpnl "dgecwug"vj g"clo "qh'vj g'uwf { "y cu" cdqww"vj gk"cdkvv{ "vq"hmvy "kpuxtwekqpu"qp"j { f tcvkqp+"y j lej "eqwrf "o cng"vj g"tguwnu" lpxcrkf 0'J qy gxgt."qpeg"vj g{ "j cf "eqo r ngvf "vj g'uwf { ."vj g{ "y gtg"f gdtlghgf "cdqww"vj g'tgcn'

clo "Cr r gpf kz "F + "cpf "y gtg"i kxgp"y g"qr r qtwpkv{ "vq"tghwug"y g"wg"qh"y gk"lphqto cvkqp"
d{ "y g" kpxgukvki cvqtu0' P qpg" qh" y g" r ctvlekr cpwu" tghwugf 0' Vj ku" eqo r nku" y kj " y g" i qqf "
r tceveleg" tgeqo o gpf cvkqpu" qh" y g" P J U" tgugetej " i qxgtpcpeg" i wkf g" *P cvkqpcn' Tgugetej "
Gy leu" Ugtxleg" 422; + "cpf "y g" Y qtrf " J gcmj " Qti cplkvkqp" *Y qtrf " J gcmj " Qti cplkvkqp"
4235+0' Vj ku" uwf { "y cu" eqpf wevgf " ceeqtf lpi "vq" y g" i wkf grikpu" rckf " f qy p" lpi "y g" F gemtcvkvkqp"
qh" J gnikpnk' cpf "cm' r tgeg f wtgu" lpxqnikpi " j wo cp" uwdlgeu" y gtg" cr r tqxgf " d{ "y g" Wplxgtukv{ "
Tgugetej " cpf " Gy leu" Eqo o kwgg" *WTGE + " cv" Qzhqtf " Dtqqngu" Wplxgtukv{ " *Cr r gpf kz " F +0'
Y tkwgp" lphqto gf " eqpugpv" y cu" qdvclpgf " htqo " cm' r ctvlekr cpwu" r tlqt "vq" y go " eqo o gpekpi "
y g' uwf { 0'

"

Vcdrg'800' Vj g' r j { ulecn' ej ctcevgtkvku" qh" y g' r ctvlekr cpwu"

"	Cm' *P " ? " 65 + "	C y ngvu" *p " ? " 44 + "	P qp / c y ngvu" *p " ? " 43 + "	p " xcng, "
Ci g. " { tu"	49" 0' 8"	49" 0' 9"	49" 0' 7"	0 5"
J gki j v. "eo "	39; " 0' 8"	3: 2' 0' 9"	39: " 0' 8"	0 4"
Dqf { "o cuu. "mi "	960 " 0' : 0"	970' 0' : 0"	960' 0' : 0"	0 7"

, p " xcng " dgy ggp " c y ngvu " cpf " pqp / c y ngvu "

"

6.3.2 Experimental design

Rctvlekr cpwu" xkukgf " y g" rcdqtcvqt { " y leg" f wtkpi " y g" uwf { 0' Qp" xkuk' 3. " r ctvlekr cpwu" i cxg"
y gk " y tkwgp " eqpugpv' hmqy gf " d{ " y gki j lpi " y go " vq" 20' ni " pgct " r tgekvkqp " kp' rki j v' emqy lpi "
cpf " dctghqqv" wulpi " c " ecndtcvgf " grgestqple " uecn " *Vcpkc " WM' Nf 0' [lgy urg { . " O kf f rugz. "
WM+0' J gki j v' y cu" cnuq " o gcuwtgf " y kj qw" uj qgu" y kj " cp" ceewtce { " qh" 20' " eo " wulpi " c "
ucf kqo gvgf " *Ugec " Nf 0' Dkto lpi j co . " WM+0' Vj gp " y g { " y gtg " lputwevgf " vq " hcu v' hqt " vgp " j qwtu "
qxgtplki j v' htqo " cm' hqqf " cpf " f tlpnu " *gzegr v' htqo " y cvgt + " r tlqt " vq " y g " hku v' wtkpg " eqmgevkvkqp "
qp" xkuk' 40' Uwdlgeu" y gtg " xgt dcm { " gpeqwtci gf " vq " nggr " y go ugrku" y gm/ j { f tcvgf "
y tqwi j qw" y g" f c { " dghqtg " xkuk' 4. " gur gekcm { " f wtkpi " y g" gxgplki 0' Vj g" xgt dcn "
gpeqwtci go gpv' i kxgp " vq " r ctvlekr cpwu" y cu" cu" hmqy < " nggr " { qwtugr " y gm/ j { f tcvgf "
y tqwi j qw" y g" f c { . " gur gekcm { " kp " y g" gxgplki . " dghqtg " y g" wtkpg " eqmgevkvkqp 0' [qw" ecp "
cej kxg " y cvd { " f tlpnu lpi " cf f kkvpcn' co qwpv' qh' y cvgt " y cp " { qwt " wuwn' lkvncng 0' Vj g { " y gtg "

cnuq"lphqto gf "v"cdueclp"htqo "cp{"wpceewuqo gf "utgpwqwu"rj {ulecn'cevkxk\."cnkpi "cp{"
 pwtkklqpcn'uwr r go gpw"*g0 0'xkco kpu"cpf "o kpgtcnu+."f tkpnkpi "creqj qn'cpf "echgkpg"46/
 j qwtu"dghqtg"xkuk"40'Qp"vj g"fc{"qh'xkuk"4."r ctvlekr cpw"eqmgevfg"vj g"htuv'o qtpkpi "wtkpg"
 uco r rg"*Xqkf 3+"cv"j qo g"uqqp"chgt"y cnkpi "wr 0'Vj g{"eqmgevfg"42"o n'qh'wtkpg"o k'utgco "
 kp"c"o ctngf "uvgtkg"eqpvclpgt0'Vj g"ugeqpf "o qtpkpi "wtkpg"uco r rg"*Xqkf 4+"y cu"eqmgevfg "
 cr r tqzko cvgn{"cp"j qwt"chgt "Xqkf 3"cv"vj g"rdqtcvqt {0'P q"tqf "qt"ftkpmu"*kpenw kpi "y cvgt+"
 y gtg" r gto kwgf " dgwy ggp" Xqkf 3" cpf " Xqkf 40' Kp" ecug" vj g" eqmgevqap" qh' Xqkf 4" y cu"
 wpuweeguuhwn"qp"vj g"htuv"cwgo r v"r ctvlekr cpw"tgugf "hqt"52"o kpwgu"dghqtg"vj g{"y gtg"
 cungf "v"t {"ci clp0'Kp"ecug"vj g"ugeqpf "cwgo r v'y cu"wpuweeguuhwn"cu"y gm"vj g"r ctvlekr cpv"
 y cu" cungf "v" tgr gcv"vj g" r tqvceqn" qp" cpqj gt" f c {0' Cm' wtkpg" uco r rgu" y gtg" eqmgevfg "
 dgwy ggp": <22"cb 0'cpf "32<22"cb 0'

"

6.3.3 Urine Osmolality

C"uco r rg"xqno g"qh'72" n'y cu" wugf "v"cpn{ug"ku"quo qnrkv{"wukpi "htgg| kpi "r qkp"
 f gr tguakp" *Quo qo cv' 252." I qpqve." Dgtrkp." I gto cp{+0' Uco r rgu" y gtg" cpn{ugf "kp"
 vkr rdecvgu"v"ko r tqxg"ceewtce{0'Vj g"tgr qtvgf "EX" "qh"vj g"vkr rdecvg"o gcwtgo gpw"y cu"
 20 ' 0'Vj g"fkhtgtpv"j {ftcvkp"ucwugu"cpf "vj gk"ew/qh" wugf "v" encukh{"uwlgeu"ctg"
 f ghkpgf "kp"Vcdrg'8040'

Co qpi uv"vj g"exckrdng"j {ftcvkp"cuuguu gpv"o gj qf u."WQuo "y cu"ej qugp"htq"ugxgcn"
 tgcuppu0'Wtkpg"quo qnrkv{"cpf "wtkpg"ur gekkhe"i tckxk{"ctg"eqpukf gtgf "xcrkf "cpf "tgnkcdng"vqnu"
 vq"cuuguu"j {ftcvkp"ucwuu"cpf "ej tqple"ej cpi gu'lp"vqcn'dqf {"y cvgt"*Cto utqpi "gv'cn03; ; : =
 Uj ktghu"("O cwi j cp"3; ; : =Cto utqpi "gv'cn03; ; 6+0J qy gxgt."vj g{"ctg"rguu"ugpukxg"vj cp"
 r rnuo c"quo qnrkv{"y j gp"wugf "v"o gcwtg"cewg"ej cpi gu'lp"vqcn'dqf {"y cvgt"*Rqr qy unk'gv"
 cn0'4223+0'Rnuo c"quo qnrkv{"j cu"dggp"encko gf "v"dg"vj g"oi qrf "ucpf ctf ö"htq"j {ftcvkp"
 cuuguu gpv" *Kpukwwg"qh"O gfkelpg"4227+=j qy gxgt."vj ku"j cu"dggp"fgdcvgf "Cto utqpi "
 4229+0'Qpg"qh"vj g"o clp"rko kcvkpu"ecp"dg"f go qpustvgf "kp"Cto utqpi "gv'cn0*4235+"y j q"
 tgr qtvgf "pq"uki phekcpv'fkhtgpeg"kp"o gcp"r rnuo c"quo qnrkv{"dgwy ggp"rny "hmkf "ftkpngtu"
 *308"N'r gt"fc{=p"? "36+"cpf "j ki j "ftkpngtu"*504"N'r gt"fc{=p"? "36+"f gur kg"46/j qwt"WQuo "
 ergctn{"uj qy kpi "vj cv'rny "ftkpngtu"y gtg"rkngr{"f gj {ftcvgf "": 26"Ö'435"o Quo qrfni^{/3}+"cpf "
 j ki j "ftkpngtu"y gtg"gwj {ftcvgf "": 5: 9"Ö'34; "o Quo qrfni^{/3}+0'Y j gp"dqj "i tqwu"uy cr r gf "
 vj gk"hmkf "kpvcng." r rnuo c"quo qnrkv{"uc{gf "vj g"uco g0'Vj ku"ku"o clpn{"dgecvug"r rnuo c"

quo qnrkx\ "ku"enqugn\ "tgi wrcvgf "d\ "vj g"j qo gquvcle"u\ uvg "y kj kp" c"xgt\ "pcttqy "tcpi g"
 *4: 2"ó"4; 2"o Quo qnrni ^{/3}="kpuwvg"qh'O gfkelpg"4227+0Qvj gt"rko kcvkpu"qh"vj ku"o gj qf "
 kpenmf g"vj g"kpccukxg"pcwtg"qh"vj g"vgej plk wg"cpf "ku"j ki j "equv"eqo rctgf "vq"vj g"qvj gt"
 cxckcdrg"vgej plk wgu0Vj gtghqtg."vj g"dguv"vy q"ej qlgu"ht"vj g"ewtgpv"uwf\ {"y gtg"WQuo "
 cpf "wtkpg"ur gekle"i tcxkv\ 0Vj gug"vy q"o gj qf u"j cxg"dggp"uj qy p"vq"dg"j ki j n\ "eqttgrcvgf "
 cpf "ctg"kpvgtej cpi gcdrg"t"? "Q 9="Cto utqpi "gv"cr03; ; 6+0[gv"WQuo "ku"eqpukf gtgf "vj g"
 i qrf/ucpf ctf "ht"guvko cvkpi "wtkpg"eqpegpvcvku" *Ej cf j c"gv"cr04223+0Vj gtghqtg."WQuo "
 y cu'o gcwtgf "kp"vj ku"uwf\ {0

"

Vcdrg"8040Vj g"ew/qh'xcnvgu'ht"vj g"fkhtgpv\j\ {f tcvkp"ucwugu"

J {f tcvkp"ucwuu"	Wtkpg"quo qnrkx\ "o Quo qnrni ^{/3} +"
Gvj {f tcvgf "	>922""
Nkngn\ "j {r qj {f tcvgf "	@922"cpf ">"; 22""
Uki pkhecpv\ "j {r qj {f tcvgf "	@; 22""
Dcugf "qp"Ucy m"et al."*4229+"cpf "Uj ktghu\ ("O cwi j cp"*3; ; : +"	

"

6.3.4 Statistics

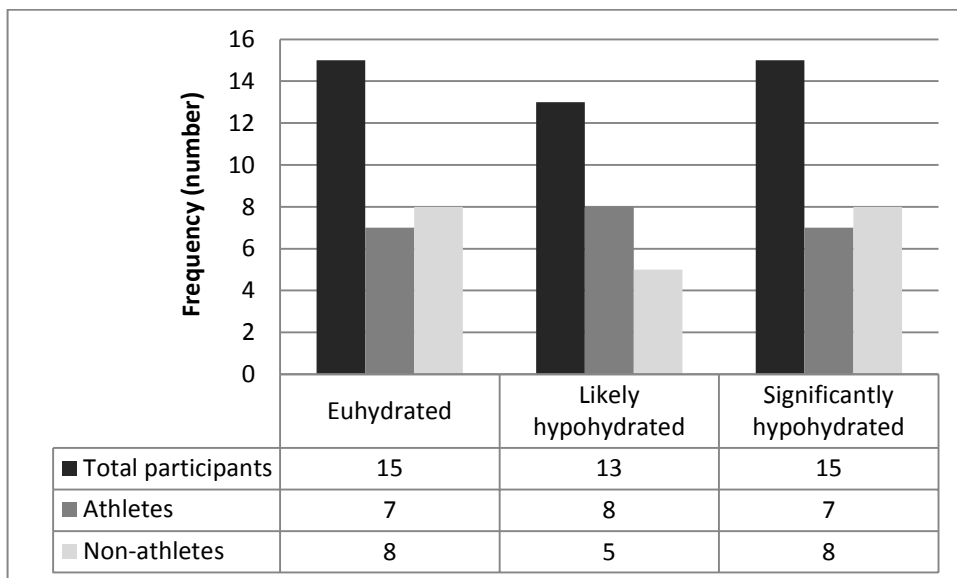
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 Wtkpg"quo qnrkx\ "cv"X3"cpf "X4"y gtg"pqto cm\ "f kntkdwgf 0Vj gtghqtg."r cktgf/uco r ng"t"vguv"
 y cu"wgf "vq"eqo rctg"vj g"o gcp"WQuo "xcnvgu"qh"Xqkf 3"versus"Xqkf 4"cpf "cvj ngvu"versus"
 pqp/cvj ngvu0Rgctup"t"eqttgrcvkp"y cu"wgf "vq"o gcwtg"vj g"eqttgrcvkp"dgw ggp"Xqkf 3"
 cpf "Xqkf 40Cmf cv"ctg"tgr qtvgf "cu"o gcpu0SD0Ucvkuecn\uki pkhecpv"y cu'ugv'cv'p >'070'
 kp"cf fkkqp."vj g"EX' " *EX"?" 322"z"o gcp IUF+"tgr qtvgf "ht" WQuo "tgr tgugpvgf "vj g"
 xctkcdkx\ "dgw ggp"vj g"vy q"wtkpg"xqkf u0Vj g"uco r ng"uk" g"y cu"ecrevcvgf "dcugf "qp"; 7' "
 r qy gt"cv" c"7' "ngxgn"qh"uki pkhecpv"cpf "wukpi "tguwmu"htqo "Rj ktrk u"et al."*4236+0Vj g"
 ecrewcvkp"uwi i guvgf "vj g"tgetwko gpv"qh"62"r ctvlekr cpw=j qy gxgt."hxg"o qtg"r ctvlekr cpw"
 y gtg"tgetwkgf "kp"ecug"qh"qwnkgtu0

"

6.4 Results

Vj g"htuv"s wguvqp"gzco kpgf "vj g"ghgev"qh" gpeqwtci go gpv"vq"uc{ "y gm/j {f tcvgf "qp"vj g" j {f tcvkp"ucwuu"qh"r ctvek cpw0Vj g"htgs wgepe{ "f kwtkdwkqp"qh"j {f tcvkp"ucwuu"dcugf "qp" htuv"o qtplpi "wtkpg"uco r ngu"ctg"uj qy p"kp"Hki wtg"800Vj g"tguwuu"kp f lecvg"vj cv'57' "qh" r ctvek cpw"y gtg"uki phtecpvn{ "j {r qj {f tcvgf."52' "y gtg"rkngn{ "j {r qj {f tcvgf."cpf"57' " gwj {f tcvgf"y kj "o gcp"ÖUF "xcwgu"qh"3265"Ö32: .": 23"Ö66."cpf"75: "Ö329"o Quo qrfni ^{/3}." tgur gevkggn{ 0' Y j gp"ugeqpf "o qtplpi "xqkf"y cu" wugf "vq"ercuukh{ "r ctvek cpw."64' "qh" r ctvek cpw"y gtg"uki phtecpvn{ "j {r qj {f tcvgf."55' "y gtg"rkngn{ "j {r qj {f tcvgf."cpf"48' " gwj {f tcvgf 0Wulpi "vj g"ugeqpf "o qtplpi "xqkf."vj g"o gcp"ÖUF "xcwgu"y gtg"325: "Ö324: .": 22" Ö69."cpf"777"Ö84"o Quo qrfni ^{/3}."tgur gevkggn{ 0'

"



"

Hki wtg"800Htgs wgepe{ "f kwtkdwkqp"qh"j {f tcvkp"ucwuu"dcugf "qp"htuv"o qtplpi "wtkpg" uco r ngu"

"

Vj g"tguwuu"qh"WQuo "qdvckpgf"htqo "vj g"cpcn{uku"qh"Xqkf 3"cpf "Xqkf 4"ht"cm"vj tgg"i tqwr u" *qvcnr ctvek cpw."cvj ngvu."cpf "pqp/cvj ngvu"ctg"uwo o ctugf "kp"Vcdrg"800Cu"ecp"dg"uggp" kp"vj g"cdrg."vj g"o gcp"WQuo "qdvckpgf"htqo "dqj "htuv"cpf "ugeqpf "xqkf u"y gtg"cm'cdqxs"vj g" 922"o Quo qrfni ^{/3}" ew/qh0'Wtkpg"quo qnrk{ "qh"Xqkf 3"cpf "Xqkf 4"y gtg"pqv"uki phtecpvn{ " f khtgpv"y kj kp"vj g"vj tgg"i tqwr u" cpf "dgw ggp"cvj ngvu"cpf "pqp/cvj ngvu" *p" @ 027+0'

J qy gxgt." xctkcdkx\ " kp" WQuo " dgy ggp" Xqkf 3" cpf " Xqkf 4" y cu" cr r ctgpn" kp" uqo g" r ctvkr cpw'y kj "cp"cxgtci g'y kj kp/uwdlgev'EX' "qh'36' 0Hki wtg'4'r tgugpu'yj g'kpf kxkf wcn' f khtgpegu"kp"WQuo "dgy ggp"Xqkf 3"cpf "Xqkf 40Cu"Hki wtg'804"uj qy u."WQuo "f getgcugf " kp"59' "cpf "kpetgcugf "kp"85' "qh'r ctvkr cpw"kp"Xqkf 4"eqo r ctgf "vq"Xqkf 30Vj g"o gf kcp" f khtgpeg"y cu"68"o Quo qfni ^{/3}0Vj g'tguwu"uj qy gf "wtqpi "eqttgrvqp"t"? "03+"dgy ggp" Xqkf 3"cpf "Xqkf 4"y kj "c"p">0230'

"

Vcdrg"8050'O gcp"htuv"cpf "ugeqpf "o qtpkpi "wtkpg"quo qrcrk\ "qh'cyj ngvu."ppp/cyj ngvu."cpf " vqcnr' ctvkr cpw"

"	Htu'v'o qtpkpi "wtkpg"uco r ng"				Ugeqpf "o qtpkpi "wtkpg"uco r ng"				P'' xcnwg, "
	O gcp"	UF "	O kp"	O cz "	O gcp"	UF "	O kp"	O cz "	"
Vqcn"									
*P"? "65+"	9; 6"	454"	579"	347: "	: 59"	433"	67; "	3454"	084"
Cyj ngvu"									
*p"? "44+"	9: 2"	444"	579"	3377"	: 47"	3: 4"	67; "	332: "	04: "
P qp/cyj ngvu"									
*p"? "43+"	: 2: "	4773"	59: "	347: "	: 6; "	457"	683"	3454"	048"

Xcnwgu"ctg"o gcp."ucpf ctf "f gxlcvqp"*UF +."o kpk wo "O kp+."cpf "o czk wo "O cz+0', p" xcnwgu"qh'Xqkf 3"vs. "Xqkf 40'

"

"

"

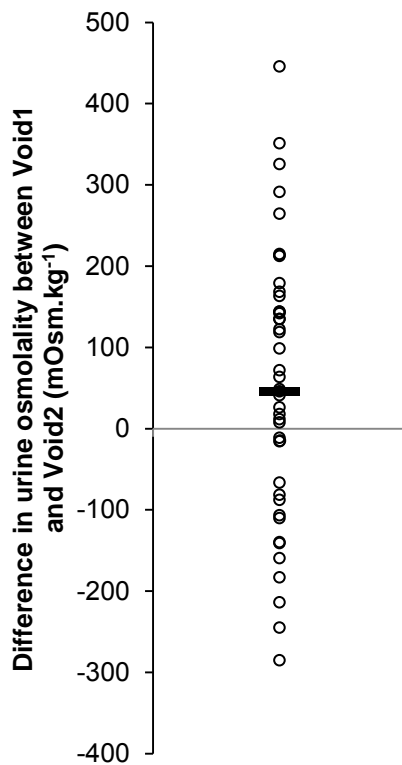
"

"

"

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"



"

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"

6.5 Discussion

C'ng{ "utgpi yj "qh'yj g'r tguvpuwuf { "y cu'yj g'f gegr vkp"qh'r ct vkr cpw"cdqww'yj g'qweqo gu" dgkpi " gzco kpgf 0' K' y cu' guvkvkn' pqv' vq" qhgt" wppgeguuct { " ewgu" kp" yj g' r ct vkr cpv' kphqto cvkqp"uj gg'cu"vq"yj g'y c { "yj cv'yj g'f cvc"y gtg"i qkpi "vq"dg"wnko cvgn { "wugf "ukpeg"yj ku" y qwf "kpxcnf cvg"yj g'r tgo kug"qh'yj g'uwwf { 0'F gegr vkp"ku"qhvgp"wugf "kp"tguvctej "uwwf kgu" o qpkqtkpi "yj g"eqo r kcpag"qh'uwdlgew"y kj "yj g'r tqvqeqn'kp"qtf gt"pqv"vq"o qf kh { "yj gkt" dgj cxkqwt *P cvkqpcn'T guvctej "Gyj leu"Ugtxleg"422; +0'Vj gtghqtg."y g'dgrkxg"yj cv'yj g'tguwuu" qdvckpgf "y gtg"yj g'tgcn'tghgevkp"qh'r ct vkr cpw"dgj cxkqwt "vqy ctf "gpeqwtci go gpv"vq"unc { " y gmj { ftcvgf "r tkqt "vq"gzr gtlo gpvkn'vkn0'

Vj g" ng { " kpf kpi " qh' yj ku" uwwf { " y cu" yj cv' qpg" kp" yj tgg" r ct vkr cpw" y cu" uki pkhecpv { " j { r qj { ftcvgf " y kj " c" WQuo " cdqwg" ; 22" o Quo qrfni ^{/3}0' Vj gug" r ct vkr cpw" y gtg" j { r qj { ftcvgf "d { "cv'ngcu'4' "qh'yj gkt"dqf { "o cuu'cv'yj g'vko g'yj g { "cttkxgf "vq"yj g'ndqtcvqt { " *Uj ktghu" (" O cwi j cp" 3; ; : +0' Hwtvj gto qtg." c" WQuo " cdqwg" 3272" o Quo qrfni ^{/3} y cu"

qdugtxgf "kp"38" "qh'r ctvlekr cpwu'y j lej "j cu'dggp'tgr qtvgf "v"eqttgur qpf "v" c'y cvgt "mquu"qh' 6/7" "DO "Ecuc."Cto utqpi ."gv'crf04222="Cto utqpi "gv'crf03; ; : -0'Vj g"ewttgpv'CEUO " i wkf grkpgu"*4229+"eqpegtplpi "gz gtekug"cpf "hmkf "tgr mrego gpv'eqpenmf gf "vj cv'f gj { ftcvkqp" qh'o qtg"vj cp"4" "DO "fko lpkuj gu"cgtdkle"gz gtekug"r gthqto cpeg"kp"vgo r gtcvg."y cto ."cpf " j qv'gp xtkppo gpw0'Gz gtekug"r gthqto cpeg"ku" hmtvj gt "f getgcugf "y kj "kpetgcukpi "ngxgn'qh' y cvgt "mquu"*Ecuc."O ctgij ."gv'crf04222+0'Rctvlekr cpwu'y kj "c"WQuo "cdqxcg"; 22'o Quo qrfni^{/3}" j cxg" vj g" r qvgpvkcn' vq" cngt" vj g" tguwmu" qh' uwwf lgu" y kj " xct { lpi " gz gtekug" r tqvqeqn0' Ej gwxtpv" cpf " eqmgci wgu" *4225+" r wdrkuj gf " c" tgxkgy " gzco lplpi " vj g" ghgeev" qh' j { r qj { ftcvkqp" qp" gpf wtcepeg" r gthqto cpeg0' Vj g" tgxkgy " eqpenmf gf " vj cv' gpf wtcepeg" r gthqto cpeg"ku"ko r cktgf "y j gp"y cvgt "mquu"gzeggf u"4" "qh"DO ."gur gekcm{ "y j gp"gz gtekug" mquu'ctqwpf "qt"mipi gt "vj cp"; 2'o kpwgu0'Gzco r ngu'qh'vj ku'kpenmf g'mipi "f kucpeg"vko g"tkcnu" uwej "cu"322/no "vko g"tkcn"*J wpygt "gv'crf04224+."r tg/mqcf gf "vko g"tkcnu"*Tcwej "gv'crf04227+" cpf "vko g"vq"gzj cwukqp"vguu"rcukpi "ctqwpf "qt"mipi gt "vj cp"; 2'o kpwgu"*I qmpken'gv'crf0 3; 96+0'kp"eqpvtcuv."uqo g"uwwf lgu"uwi i guv'vj cv'o knf "j { r qj { ftcvkqp"*c"4" "DO "+ecp"tgf weg" cgtqdle"r gthqto cpeg"kp"uj qtvgf "f wtcvkqp"gz gtekugu0'Cto utqpi "et al."*3; : 7+"uj qy gf "vj cv' cvj ngvu'r gthqto gf "uki pkhecpvnl "y qtug"kp"7222/"cpf "32222/o "twppkpi "gxgpw"*8" "umy gt+" y j gp"vj g{ "y gtg"j { r qj { ftcvgf "d{ "4" "qh'vj gkt"dqf { "o cuu0'Vy q'r gtegpv"j { r qj { ftcvkqp"j cu" cnq"dggp"uj qy p"vq"tgf weg"r tg/mqcf gf "vko g"tkcn'r gthqto cpeg"rcukpi "62'o kpwgu"d{ "35"cpf " 9" "kp"wpvckpgf "cpf " vckpgf "uwdlgeu."tgur gevkggn{ "*O gtt { "gv'crf0 4232+0' Hmtvj gto qtg." Dctf ku"gv'crf0 *4235+"f go qpuxtcvgf "vj cv'7/no "j kn'enko dlpki "vko g"tkcn'r gthqto cpeg"y cu" tgf wegf "d{ "70" "kp"y gm'vckpgf "cvj ngvu"y j kg"j { r qj { ftcvgf "d{ "3" "eqo r ctgf" vq" gwj { ftcvgf "0"

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y km'dg"3: 2"Y "kpungcf "qh'422"Y 0'Vj ku'ku'rkngn{ "vq'dg"ecwugf "d{ "c"eqo dlpvcqp"qh'hcevqtu"
kpenmf kpi "tgf wegf "o czko cn'ectf kce"qwr ww"*I qp| a ng| /Cmpuq"gv'crf'3; ; 7="O qpvcqp"gv'crf'
4229+"cpf lqt"j gcv'utguu"*Ucy nc"gv'crf'3; ; 7+0"

Cpqvj gt"tgcuqp"y j { "tgugctej gtu"uj qwf "r c{ "enug"cwgpvcqp"vq"j { r qj { ftcvqp"dgqgtg"c"
XQ4o cz "vgu'ku'dgecwug"ku"ko r cev'qp"dnqf "necvgeqpegpvtcvkpu0'O qs wkp"cpf "O c| | gq"
*4222+"gzco kpgf "vj g"ghgev"qh'407' "j { r qj { ftcvqp"qh'DO "qp"necvgeqpegpvtcvkqp"fwtkpi "
cp"ketgo gpwn'vgu'wpvki'gzj cwukqp"kp"ugxgp"o qf gtcvgn{/vckpgf "hgo cng"cy ngvu0'T guwnu"
uj qy gf "c"uj km'kp"vj g"necvge"ewtxg"wr y ctf 0'O gcp"i tqwr "y qtnitcvge"cv'necvge"vj tguj qrf "y cu"
tgf wegf "y j gp"uwdlgeu"y gtg"j { r qj { ftcvge"34: "Ō8"Y "+eqo r ctgf "vq"gwj { ftcvge"368"Ō7"
Y +0'Qz{i gp"wr wmg"y cu"cnq"tgf wegf "d{ "; ' "cv'necvge"vj tguj qrf "y j gp"uwdlgeu"y gtg"
j { r qj { ftcvge'0' O qs wkp" cpf " O c| | gq" eqpenmf gf " vj cv" vj g" ketgcug" kp" gr kgr j tkgp"
eqpegpvtcvkqp"kp"vj g"j { r qj { ftcvge "ucvge"r n{ gf "cp"ko r qtcvpv'tqng'kp"vj g"uj km'qh'vj g"necvge"
ewtxg0'

Vj g'tguwnu"qh'vj ku'uwf { "kpf kcvge"vj cv'87' "qh'uwdlgeu"y gtg"cdqxs"vj g"gwj { ftcvqp"ew/qhh"
qp"xlkv'4"cpf "kv'fkf"pqv'o cwtg"y j gyj gt"uwdlgeu"y gtg"cy ngvu"qt"pqp/cy ngvu0'Vj g"
r gtegpvi g"qh'cy ngvu"cdqxs"vj g"ew/qhh"y cu"uko kmt"vq"pqp/cy ngvu"93' "cpf "84' ".
tgur gevkgng{ +0'Vj gug'tguwnu"ctg"eqpukngpv'y kj "vj g"fcv"qdvckpgf "d{ "Rj kkr u"et al."*4236+"
cpf "Xqr g"et al."*422; +y j q'hqwpf "vj cv'99' "cpf "88' ".tgur gevkgng{ "qh'cy ngvu"cttkxf "vq"
vj g"vcklpi "uguukqp"rkngn{ "j { r qj { ftcvge'0'Vj ku'tghgeu"vj cv'vj gug"cy ngvu"j cxg"hcngf "vq"
ko r ngo gpvtgj { ftcvqp"utcvgi kgu'chgt"vcklpi "uguukpu0'Vj ku'eqwf "dg"ecwugf "d{ "vj g"nemi"
qh'ur qt w'pwtklkpcn'npqy ngf i g"kp"eqngi kcvge"cy ngvu"y j q"ueqtf "; ' "qp"cu'rt w'pwtklkqp"
npqy ngf i g"swgukppcgtg"eqo r ctgf "vq": 5' "kp"Utgpi vj "cpf "eqpf klkplpi "ur gekrkuv"
*Vqttgu/O eI gj gg" gv' crf' 4234+0' Uwej " rti g" pwo dgt" qh" r ctvlekr cpw" y j q" ctg" rkngn{ "
j { r qj { ftcvge "cv'vj g"dgi kplpi "qh'cp"gzgtekg"vgu'ecp"j cxg"cpqvkcgcdng"ko r cev'qp"uwf { "
qweqo gu."gur gekcm{ "cgtqdle"r gthqto cpeg0'Eqpugs wgpwn{ "tgugctej gtu"uj qwf "r c{ "enugt"
cwgpvcqp"y j gp"cy ngvu'r wtuwg'y kj "vj gkt"vcklpi "tqwkpg"y j kg'vcklpi "r ctv'kp"vj g"uwf { 0"

Uq"y j cv'ecp"gzr mlp"vj g"j ki j "pwo dgt"qh'cy ngvu"cpf "pqp/cy ngvu"y j q"wtpgf "wr "vq"vj g"
ndqtcvqt { "uki phkcpwn{ "f gj { ftcvge "kp"vj g"ewtgpv"uwf { A'Rgttktg"cpf "eqngci wgu"*4235+"
kf gpvkhgf "vy q"i tqwr u"qh'kpf kklf wcu'dcugf "qp"vj g"xqno g"qh'hwkf "eqpuwo gf "r gt"fc{ <ny "
f tlpngtu"*Ō304"rktgu"cpf "j ki j "f tlpngtu"*4"ó"6"rktgu0'Vj g"o gf kcp"Ō'UG"ktuv"o qtplki "
WQuo " qh" vj g" ny " cpf " j ki j " f tlpngtu" y gtg" 9; 6" Ō' 62" o Quo qrfni ^{/3} cpf " 7; 2" Ō' 69"
o Quo qrfni ^{/3} ".tgur gevkgng{ 0'Hwtvj gto qtg."Cto utqpi "gv'crf'*4235+"gzco kpgf "46/j t"WQuo "

qh'my "308"N'r gt"fc{+"versus"j ki j "504"N'r gt"fc{+"ftkpngtu"ht"wy q"fc{u0Vj g"uwf {"
 tngxgrgf "y cv" WQuo "y cu" uki pkkcpw{"j ki j gt"qp"fc{"3"qh"my "ftkpngtu": 26" Õ' 435"
 o Quo qrfni ^{/3} +eqo rctgf "vq"j ki j "ftkpngtu": 5: 9" Õ' 34; "o Quo qrfni ^{/3} +0P gzv"my "ftkpngtu"
 y gtg"rtguetldgf "507"N'qh'y cvgt"cpf"j ki j "ftkpngtu">"4"N'r gt"fc{"ht"hw"fc{u0Cu"tguwv"
 yj g" WQuo "qh"my "ftkpngtu"y cu" fgetgcugf "vq"ç" 496" o Quo qrfni ^{/3} cpf"j ki j "ftkpngtu"
 kpetgcugf "vq"ç"7; 4"o Quo qrfni ^{/3} 0Vj gtghgt. "j {r qj {ftcvkp"eqwf "dg"tgxgtugf "h'y cvgt"ku"
 rtguetldgf 0K'ku"rkgn{"y cv'r ctvlekr cpw"qh'yj g"ewtgpv"uwf {"y j qo "WQuo "y cu"cdqyg"; 22"
 o Quo qrfni ^{/3} ctg"my "ftkpngtu": 0304"rktgu+"qt"fkf "pqv"eqpuwo g"gpqwi j "y cvgt"ht"fkhtgpn"
 tgcuppu0 Vj g" dguv"uqnwkp"vq" o kpk kug" yj g" rkgnkj qqf "qh" yj gug" r ctvlekr cpw" vq" dgi kp"
 gzer gto gpvni/tkni"j {r qj {ftcvgf "ku"vq"ko r ngo gpv'c"rtg/vtkni"j {ftcvkp"utcvgi {0"

Vy q"o clp"utcvgi kgu"j cxg"dgpp"uj qy p"vq"dg"uweeguhw0 Vj g"htuv"utcvgi {"eqpukuv"qh"
 kpwtvlekr "r ctvlekr cpw"vq"ftkpn'c"ur gekhe"co qwpv"qh"hwk" 46/j qwtu"rtkqt"vq"tkni"cpf "
 o gcwtg" eqo r kcpag" pgzv"fc{0' Hqt" gzco r ng. "Ej gwxtpv" et al." *4232+ "gzco kpgf" yj g"
 ko r qtvcpag"qh"ko r ngo gpvpi "c"j {ftcvkp"utcvgi {"y j g"fc{"dghgtg"cp"gzr gto gpvni/tkni"qp"
 j {ftcvkp"ucwu0Rctvlekr cpw"y gtg"i kxgp"5"N'qh"hwk"vq"eqpuwo g"qxgt"yj g"fc{"wpki"32"
 r 0'0cpf "kpwtvlekr"vq"eqpuwo g"y gkt"j cdkwcn'f kgv'cpf "vq"ftkpn'cf f kkpccn'hwk"kh'yj g{"
 y cpvgf "vq0Vj gkt"vqcn'hwk"kpvcng"tgej gf "ç508"N0Rctvlekr cpw"y gtg"cuq"lphqto gf "vq"huu"
 htqo "32"r 0'0wpki"8"co 0'dghgtg"rtqxf kpi "c"wtkpg"uco r ng"vq"o gcwtg"wtkpg"quo qrcrk{"
 *WQuo +0' Vj g"tguwv"lpf kcvg"y cv'o quv"r ctvlekr cpw"y gtg"gwj {ftcvgf "y kj "cp"cxgtci g"
 WQuo "qh" 836" o o qrfni ^{/3} *tapi g< 427/32; 3+ "wulpi " yj g" 922" o o qrfni ^{/3} ewqhh"ht"
 j {r qj {ftcvkp0"

Uqo g"tgugctej gtu"rtghgt"vq"tgfweg"tkunkpi "j {r qj {ftcvkp"qp"yj g"o qtpkpi "qh"yj g"vguv'd {"
 rtqxf kpi "c"ur gekhe"co qwpv" *472/722"o n"qh"hwk"uj qtv {"*62/342"o kpwgu+"dghgtg"yj g"
 uctv'qh'yj g"gzr gto gpv"Uj ktghu"gv'cn04226=Rqr qy unk'gv'cn04223=Qr r rki gt"gv'cn04227+0'
 Vj g"ghgevxgpguu"qh"yj gug"utcvgi kgu"j cxg"dgpp"tgr qtvf "cuuguupi "r ncuo c"quo qrcrk{"
 y j kej "ku"cdkqo ctngt"wgf "kp"yj g"cuuguuo gpv'qh"j {ftcvkp"ucwu0C"uwlgev'y kj "c"r ncuo c"
 quo qrcrk{"cdqyg"4; 2"o Quo 0ni ^{/3} "ku"rkgn{"vq"dg"j {r qj {ftcvgf "Ucy n"gv'cn04229+0' Vj g"
 eqpuwo r vqp"qh"c"ur gekhe"co qwpv"qh'y cvgt"yj g"fc{"dghgtg"tkni"hqmy gf "d{"qxgtpi j v"
 huupi "tguwngf "kp"r ncuo c"quo qrcrk{"dgw ggp"4: 9"cpf "4; 5"o Quo 0ni ^{/3} *Dctvqm'gv'cn0'
 4226=Mgpgghem'gv'cn04232=Htgwfp "gv'cn0'3; ; 7=Qrkxgt"gv'cn0422: =Y cnj "gv'cn04226+."
 y j gtgcu."uwf kgu"y j q"qpn"lphqto gf "r ctvlekr cpw"vq"eqpuwo g"y cvgt"hy "j qwtu"dghgtg"tkni"
 tgr qtvf "r ncuo c"quo qrcrk{"rgxgn"dgw ggp"4: 3"cpf "4: : "o Quo 0ni ^{/3} *O ceni'gv'cn0'3; ; 6=

Qr r r k i g t "g v" c r 0'4227="R q r q y u n k" g v" c r 0'4223="U c e j g p h g r f "g v" c r 0'3; ; 8="U c e j g p h g r f "g v" c r 0'4222="U j k t g h u" g v" c r 0'4226+0"

C n j q w i j "H l u e j d c e j " *4226+" t g r q t v g f " v j c v" X q k f 3" k u" v j g" o q u v" e q p e g p v t c v g f " u c o r n g" q h" v j g" f c { . " u q o g q p g" o k i j v" c t i w g" v j c v" X q k f 4" o k i j v" d g" o q t g" e q p e g p v t c v g f " f w g" v q" q p i q l p i " h w k f" m u u g u" y k j " p q" c f f k k q p c n" u q w t e g" q h" h w k f" l p r w 0' V j g" h k p f l p i u" q h" v j g" e w t t g p v" u w f { " u j q y g f " c" n e t i g" x c t k c v k p" l p" v j g" f k h g t g p e g" d g w g g p" h k t u v" c p f " u g e q p f " o q t p l p i " W Q u o " x c n w g u" y k j " p q" e r g c t " t g p f " v q y c t f u" c" t g f w e v k p" l p" e q p e g p v t c v k p" l p" X q k f 4" c u" c t i w g f " d { " H l u e j d c e j " *4226+0' k p" h c e v" q w t" h k p f l p i u" u j q y g f " v j c v" 85' " q h" r c t v k e r c p w" j c f " c" W Q u o " j k i j g t" l p" X q k f 4" v j c p" X q k f 30' V j k u" x c t k c v k p" l p" W Q u o " d g w g g p" X q k f 3" c p f " X q k f 4" j c f " c" u o c m" l o r c e v" q p" v j g" e n c u u k h k e c v k p" q h" r c t v k e r c p w" l p" v j g" f k h g t g p v" j { f t c v k p" e c v g i q t l g u 0' D c u g f " q p" X q k f 4. " h g y g t" r c t v k e r c p w" y g t g" e n c u u k h k e f " c u" g w j { f t c v g f " c p f " o q t g" c u" u k i p k h k e c p w" j { r q j { f t c v g f 0' V j g" e q n g e v k p" q h" X q k f 4" e q w f " d g" r t c e v k e c n" l p" u k w c v k p u" y j g t g" c p" g z g t e k u g" v g u v" y k m" d g" e q o r n g v g f " q p" v j g" h k t u v" x k u k" * g 0' 0' X Q 4 o c z " v g u v" f w t l p i " v j g" r t g n k o k p c t { " v g u v" 0' k p" v j k u" e c u g" t g u g c t e j g t u" y k m" p q v" j c x g" v j g" q r r q t w p k v { " v q" i k x g" r c t v k e r c p w" v j g" w t k p g" e q p v c k p g t" r t k q t " v q" v j g" v g u v 0'

"

6.6 Conclusion

V j g" t g u w u" q h" v j k u" u w f { " l p f l e c v g" v j c v" g p e q w t c i l p i " r c t v k e r c p w" v q" f t l p m" y c v g t" l p" v j g" r t g/ v t k n" r t g r c t c v k p" r g t k f " k u" p q v" u w h k e l g p v" v q" t g c e j " g w j { f t c v k p" l p" c m" u w d l g e w 0' V j g" h c e v" v j c v" v j g { " c t g" c v j n g v g u" q t" p q p/ c v j n g v g u" f k f " p q v" o c n g" c" f k h g t g p e g" v q" v j g" j { f t c v k p" u c w u" q p" v j g" o q t p l p i " q h" v j g" v g u v 0' D c u g f " q p" v j g" t g u w u" q h" q v j g t" u w f l g u. " k" o c { " d g" t g c u q p c d r g" v q" c f x l e g" c v j n g v g u" c p f " p q p/ c v j n g v g u" v q" f t l p m" v q" c" u r g e l k e f " u t c v g i { " d g h q t g" v j g { " e q o g" l p" v q" v j g" n e d q t c v q t { 0' T g u g c t e j g t u" v j c v" t w p" v t k e n" y j g t g" j { f t c v k p" u c w u" k u" l o r q t c p v" v q" q w e q o g u" u j q w f " e q p u k f g t" o g c u w t l p i " w t k p g" q u o q n c r k v { " d g h q t g" v j g" u c t v" q h" v j g" v t k e n" v q" o g c u w t g" v j g" e q o r n c p e g" q h" r c t v k e r c p w" v q" v j g" j { f t c v k p" u t c v g i { 0'

"

Chapter 7

The effect of mode of transport on glycaemic index testing

7.1 Summary

Vj g"ghgeV"qh'o qf gtcvg"kpvgpukv{"gzgtekug."uwej "cu"y cv"wguf "cu"o qf g"qh"tccpur qtv."qp" i n{ecgo le"lpf gz"K'K'vgukpi "ku"wpengct0Vj g"clo "qh"y ku"uwf {"y cu"vq"lpvgukv cv"y g"ghgeV" qh" cewg" gzgtekug" *y cmkpi " cpf " e{enkpi "+" rtkqt" vq" I K'vgukpi " qp" y g" y kj kp/uwdlgev" xctkcdkkrv{"qh"dmqf"i nweug"cpf "kpukp"tgur qpugu0Grgxgp"ugf gpvct{"qt"tgetgcvkqpcmv{" ceVxg"o gp"xkukgf"y g"rdqtcvqt{"hqt"vko gu0Vj g{"wpf gtvgqm"r tgrko kpct{"vgu"cv"xkuk"3." yj gp"tguv"47"o kp+e{enkpi "36"o kp"cv"72' "XQ4o cz+"cpf "y cmkpi "3"j "cv"59' "XQ4o cz+" vguu"ht"y g"y tgg"uwdugs wgpv"xkuku"i kxgp"kp"tccpf qo "qtf gt"hmuy gf "d{"c"hxg"o kpwg"tguv" cpf "c"y qj"qwt"i nweug"vgu0F wtkpi "y g"i nweug"vgu"dmqf "uco r ngu'y gtg"vngp"cv'o kpwg"/ 7."2."37."52."67."82."; 2."cpf "342"hmuy kpi "y g"i nweug"ftkpn'eqpvckkpi "72"i "qh"cxckrdng" ectdqj {ftcvg0Dmqf "uco r ngu'y gtg"uwdugs wgpv{"cpcn{ugf "ht"i nweug"cpf "kpukp0Vj g" j k j guv'o gcp"EX' "qh"i nweug"ctgc"wpf gt"y g"ewtxg"K' CWE+"y cu"qdugtugf "dgy ggp"tguv" cpf "Y cmkpi "52' "+"hmuy gf "d{"Y cmkpi "cpf "E{enkpi "48' "+"y j kg"y g"j k j guv'o gcp" EX' "qh"y g"kpukp"CWE"K'CWE+"y cu"qdugtugf "dgy ggp"Y cmkpi "cpf "E{enkpi "4:' "+" hmuy gf "d{"tguv"cpf "Y cmkpi "46' +0Vj g"muy guv"i CWE"cpf "KWE"y gtg"qdugtugf " dgy ggp"tguv"cpf "E{enkpi "47' "cpf "36' .tgur gevkggn{+0P q"ucvukecmv{"uki phkcpv"ghgeV" y cu"f gvevgf "dgy ggp"cm'eqpf kkp0Vj g"lpf kpi u"qh"y ku"uwf {"uwi i guv"y cv'r ctvckr cpw" uj qwf "cxqkf"ej cpi kpi "y g"o qf g"qh"tccpur qtv"dgy ggp"xkuku"gur gekmv{"y cmkpi "vq"y g" rdqtcvqt{"qp"y g"o qtpkpi "qh"v"vgu"kh"cpqy gt"o qf g"qh"tccpur qtv"y cu"wguf "qp"y g"qy gt" vguvpi "f c{u0

7.2 Introduction

Kp" 4232." y g" Kpvtpcvkqpcn" Qti cplucvkqp" hqt" Ucpf ctf kucvkqp" *KUQ+" r vdrkuj gf "ku" hkuV" gf kkp"qh"y g"i vlf grkpgu"ht"ucpf ctf kulpi "y g"f gyto kpcvkqp"qh"i Kqh"hqf u"ht"r tceveg" cpf "tgugtej "r wtr qugu"Kpvtpcvkqpcn"Ucpf ctf u"Qhleg"4232+0Ceeqtf kpi "vq"y g"tgr qtv" uwdlgeu"uj qwf "cxqkf"xli qtqwu"gzgtekug"qp"y g"o qtpkpi "qh"y g"vgu"cu"kv"j cu"dggp"uj qy p" vq"tckug"y j qrg"dqf {"i nweug"vr vng"cpf "I CWE"*Tqug"gv"cr04223+0Vj ku"y kn't guwv"kp"cp" kpetgcug"lp"EX' "dgy ggp"tkcni"cpf "r quukdn{"gzeggf"y g"ceegr vcdng"rgxgn"qh"xctkcdkkrv{"hqt" tghgtpeg"hqf "qh"52' "Kpvtpcvkqpcn"Ucpf ctf u"Qhleg"4232+0Vj g"rti g"y kj kp/uwdlgev" xctkcdkkrv{"hqt"y g"tghgtpeg"hqf"ecp"f getgcug"y g"ceewtce{.r tgekukp."cpf "tgr tqf vekdkrv{" qh"i K"Dtqwpu"gv"cr04227+0K"ku"r quukdn"y cv'r gqr ng"y kn'cxqkf "gzgtekug"kp"y g"o qtpkpi "

dghqtg" yj g"vgu"dw"y kn'pqv"eqpukf gt" yj gk" hqto "qh" tpcupr qtv" cu" gz gtekug" cpf "o c{ "wug" y cmkpi "cpf "e{ erkpi "cu" c"o qf g"qh" tpcupr qtv" kp" qtf gt "v" eqo o wg" v" yj gug" t guctej "uwf lgu" Vj gtg" j cu" dggp" rkwg" ci tgggo gpv" qp" yj g" ghgev" qh" ny "v" o qf gtcv" kpvgpukf "gz gtekug" qp" I K' vguvpi 0Uqo g" uwf lgu" j cxg" uj qy p" pq" ghgev" qp" i n' ecgo le" t gur qpug" chgt "cgt qdle" gz gtekug" *Tqdg tw" gv" cr0'4235=Dgp/Gl tc" gv" cr0'3; ; 7+0'Y j gtgcu. "qvj gtu" j cxg" qdugt xgf "c" f getgcug" *Dqpgp" gv" cr0'3; ; : + "qt" cp" kpetgcug" kp" I C WE " *Tqug" gv" cr0'4223=Mp wfgp" gv" cr0'4236+0' Gkj gt" y c{ . "y j gvj gt" k' ku" cp" kpetgcug" qt" c" f getgcug. "yj g" EX' "qh" yj g" o gcuwtgo gpv" y kn' dg" chgev" f "d{ " yj ku" ej cpi g0T gi ctf ngu" qh" y j gvj gt" yj ku" ej cpi g" r gcf u" v" c" EX' "cdqxg" 52' "qt" pqv. "t guctej gtu" uj qwf " cry c{ u" cko "v" o kpo kug" k' kp" qtf gt "v" ko r tqxg" r tgekuk qp0' K' uj qwf " dg" pqvgf " yj cv' ppg" qh" yj g" cdqxgo gpv' kpgf "uwf lgu" tgr qtvgf " yj g" EX' "dgw ggp" tknu0'

Wpf gtucpf kpi " yj g" ghgev" qh" y cmkpi "cpf "e{ erkpi "cv" cp" cxgtci g" r ceg" qh" eqo o wkpi . "qp" dmqf " i nweug" cpf "kpuwkp" ngxnu" ku" r ctvewrtn{ "ko r qtvcv0' Uwdlgeu" o c{ "eqo g" d{ "dwu" *tguv" v" qp" g' xkuk" cpf "e{ eng" qt" y cmv" v" cpqj gt "xkuk0Cp{ "cngtcvkp" kp" yj g" v' r g. "f wtcvkp" qt" kpvgpukf " qh" yj g" cevxxk{ " o c{ " cff" pqkug" v" yj g" tguwmu" cpf " j gpeg" tgf weg" yj gk" tgr tqf wekdkrk{ 0' Vj gtghqtg. " yj g" cko "qh" yj ku" uwf { "y cu" v" kpxguki cvg" yj g" ghgev" qh" cewg" gz gtekug" *y cmkpi "cpf "e{ erkpi + "r tkqt" v" I K' vguvpi "qp" yj g" y kj kp/ uwdlgev" xctkcdkrk{ "qh" dmqf " i nweug" cpf "kpuwkp" t gur qpugu0'

"

7.3 Materials and methods

7.3.1 Participants

Grgxgp" o gp" r ctvlekr cvgf "kp" yj g" r tguv" uwf { "cv" Qzhqtf "Dtqqngu" Wpkxgtukf 0' T getwko gpv" qh" r ctvlekr cpw" y cu" o cf g" yj tqwi j " r quvgtu" r megf " ctqwpf " eco r wu" cv" Qzhqtf "Dtqqngu" Wpkxgtukf 0' Rj { ulecn' ej ctcevgtkueu" qh" yj gug" r ctvlekr cpw" ctg" r kugf "kp" Vcdng" 9080' Gki kdkrk{ " etkgtlc" lpenf gf <

- Ugf gpvct { "qt" tgetgcvkpcmf "cevxxg" o crgu"
- Gz gtekukpi "guu" yj cp" qt" gs wcn' v" yj tgg" kko gu" c" y ggml"
- Ci gf "dgw ggp" 3: /62" { gctu"
- DO Kdgw ggp" 3: 0' "cpf "47"
- Htgg" qh" o gxcdqrk" f kuqtf gtu" *g0 0f kcdgvgu. "ectf kqxcuewrct" f kugcug. "qt" j { r gtvgpukqp +"

- P qv' cmlpi " cp{ " o gf lecvkp" npqy p" vq" chgey' i nwequg" vqrntcpeg" *g0 0' uvgtqkf u." cpvr u{ej qvle+ "
- P qv' lqvqrntcpv' qt' cmgti le' vq' cp{ " qh' yj g' hqgf ' r tqxkf gf "

Vj ku' uwf { "y cu' eqpf wevgf " ceeqtf lpi " vq" yj g" i wlf grkpgu" rclf " f qy p" lp" yj g" F gerntcvkp" qh" J gnulpnk" cpf " cm' r tqegf wtgu" lpxqrlpi " j wo cp" uwdlgeu" y gtg" cr r tqxgf " d { " yj g" Wpkxgtukv { " Tgugctej " cpf " Gj leu" Ego o kwgg" *WTGE+ " cv' Qzhqtf " Dtqqngu" Wpkxgtukv { " *Cr r gpf kz " G+0' Y tkwgp" lphqto gf " eqpugpv' y cu' qdvclpgf " htqo " cm' r ctvlekr cpw' r tkqt " vq" yj go " eqo o gpeki " yj g' uwf { 0' "

"

Vcdrg' 9080Ej ctcevgtku' leu' qh' yj g' r ctvlekr cpw' cv' dcugrlpg "

Ej ctcevgtku' "	Xcnuw "	"
Ci g' *{ gct+ "	48' 06"	
Dqf { 'o cuu' *mi + "	968' 08"	
J gki j v' *eo + "	399' 09"	
XQ _{40 cz} " *o rfm ^{/3} l ^{/3} + "	628' 08"	
Y qtmqcf " cv' 72' " XQ _{40 cz} " *Y + "	; 8' 053"	
Y cmlpi " lqvpgukv { " * XQ _{40 cz} + "	59' 08"	
Xcnuw " ctg' o gcp' 0' UF 0'		

"

7.3.2 Experimental overview

Rctvlekr cpw' xkukgf " yj g" rcdqtcvqt { " hqwt' vko gu' f wtlpi " yj g" uwf { 0' Vj g { " wpf gtvqqm' c" r tgrko kpct { " vgu' cv' xkukv' 3. " yj gp' tguv' e { enlpi " cpf " y cmlpi " vguv' hqmuy gf " d { " c' hkg' o kpwg" tguv' cpf " c" y q' j qwt " i nwequg" vguv' hqt " yj g" yj tgg" uwdugs wgpv' xkuku" i kxgp" lp' tcpf qo " qtf gt0' Rctvlekr cpw' y gtg" cmqecvgf " wulpi " c" eqo r wgt/ i gpgtcvgf " rkuv' qh" tcpf qo " pwo dgtu" *O letquqlh' Gzegn' Tgf o qpf . " Y cuj lpi vqp. " WUC+0' Vj g' I Ky cu' o gcuwgf " wulpi " yj g' r tqvqeqn' cf cr vgf " d { " Dtqwpu" cpf " eqmgci wgu" *Dtqwpu" gv' cr0' 4227+ " cpf " d { " hqmuy lpi " yj g" KUQ" i wlf grkpgu" * lqvgtpcvqp cn' Ucpf ctf u' Qhheg" 4232+0"

7.3.3 Preliminary testing

Rctvlekr cpwu"cttkxgf "cv"vj g"rdqtcvqt {"chgt"hcukpi "hqt"vj g"rcuv"vj tgg"j qwtu."cxqkf kpi "echhgkpg"eqpuwo r vkqp"hqt"vj g"rcuv"32"j qwtu."j cxkpi "cxqkf gf "vj g"eqpuwo r vkqp"qh"creqj qn"cpf "tghtckpgf "htqo "cp {"utgpwqwu"r j {"ulecn'cevkxk {"hqt"vj g"rcuv"46"j qwtu0Vj gk"j gki j v'y cu"vngp" wulpi "c"ucf kqo gvg" *Ugec" Nf 0" Dkto kpi j co ."WMH: "vj gk" dcf {"o cuu"cpf "dcf {"eqo r qukkqp" y gtg" o gcuwtf " wulpi " Vcplkc" DE/63: " O C" *Vcplkc" WM' Nf 0" [lgy ung{." O kf f rguz."WMH"dcf {"eqo r qukkqp"cpn{ uku0

Vj gp"r ctvlekr cpwu"eqo r rvgf "y q"uwo czko cn'gzgtekug"vguw"hmmy gf "d {"c"XQ4o cz "vgu0Vj g"htuv"uwo czko cn'vgu"eqpukvgf "qh"y cmkpi "cv" c"ugcf {"r ceg"qh"7" n0 j³"cpf "3" " i tcf kpv" hqt" vgp" o kpwgu" y j kg" vnkpi "i cu" o gcuwgo gpw" vq" f gvgto kpg" XQ4" wulpi "cp" cwqo cvgf "i cu"cpn{ uku"u{ ugo "O gcn{| gt"5D."Eqtvz."I gto cp {"0Vj ku"vgu"y cu"wgf "vq" f gvgto kpg"vj g"lpvgpuk {"qh"y cmkpi "cu" c"r gtegpwi g"qh"XQ4o cz0Uwdlgeu"tgvgf "hqt"32" o kpwgu"dghqtg"vj g {"eqo r rvgf "vj g"ugeqpf "uwo czko cn'vgu"y j lej "eqpukvgf "qh"hxg"uci gu" qh'e {enkpi "gzgtekug0Vj g"y qtn'mqcf "uctvgf "cv"62"Y cw"*Y + "cpf "r tqi tguukxgn {"kpetgcugf "d {"37"Y "gxgt {"6" o kpwgu"knk"tgcej gf "322"Y "cv"uci g"70Vj ku"vgu"y cu"wgf "vq" f gvgto kpg"vj g" y qtn'mqcf "qh"vj g"e {enkpi "eqpf kkp0Hmmy kpi "vj g"uwo czko cn'vgu."uwdlgeu"vqni" c"37" o kpwg"tgu"cpf "vj gp"r gthqto gf "cp" kpetgo gpvntco r "gzgtekug"vgu"100XQ4o cz "vgu"qp" cp" grgvtqo ci pgvlecm {"dtngf "e {eng"gti qo gvg" *Eqtkcn Nqf g."Vj g" P gy gtrcpf u0I cu" cpn{ uku"y cu"r gthqto gf "vj tqwi j qw"vj g"vgu" wulpi "vj g"cwqo cvgf "i cu"cpn{ ugt" o gpvkqp" gctrkt0Vj g" kpetgo gpvkqp"tcvg"y cu"7"Y "gxgt {"37"ugeqpf u"eqttgur qpf kpi "vq"tco r "unqr g" qh"42"Y "r gt" o kpwg"htqo "c"dcugrkpg"qh"42"Y 0Vj g"vgu"y cu"vgo kpcvgf "cpf "XQ4o cz "y cu" eqpukf gtgf "tgcej gf "y j gp"vy q"qh"vj g"hmmy kpi "etkgtk"y gtg" o gv<3+"vj g"r ctvlekr cpv"eqwf " pq"mpi gt "uwuclp" c"r gf cmkpi "ecf gpeg"qh'cv'rcuv"82"tr o ."4+"c"tgur kcvqt {"gzej cpi g"tcvk "x" 30."5+"cp" kpetgcug"lp"qz {i gp"wr vng">"204"n0 kp³"*J qy ng {"gv'cn03; ; 7+0Hqt"vj ku"uwf {"."vj g" o czko cn'vgu"y cu"r tgeg gf "d {"c"uwo czko cn'vgu"ht"r tcevkcn'tgcuppu0K"j cu'dggp"uj qy p" vj cv" o czko cn' qz {i gp"wr vng" ku" pqv" chgevgf "d {"xct {kpi "uci gu" qh" gzj cwukqp" cv" vj g" dgi kppkpi "qh"vj g"vgu"Uco hqtf "gv'cn03; 9: +0

"

7.3.4 Experimental protocol

Rctvlekr cpwu"cttkxgf "cv"vj g"rdqtcvqt {"chgt"32/j qwtu"qxgtpli j v'hcukpi ."j cxkpi "cxqkf gf "vj g" eqpuwo r vkqp"qh"creqj qn"cpf "echhgkpg"cpf "tghtckpgf "htqo "cp {"utgpwqwu"r j {"ulecn'cevkxk {"

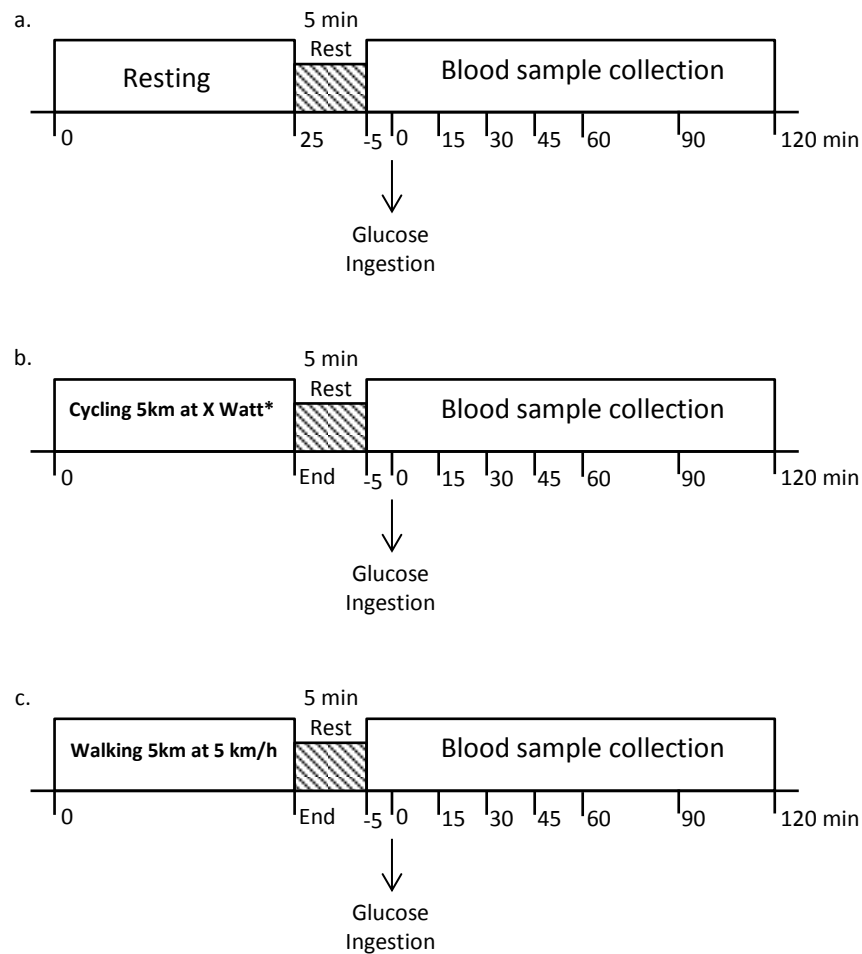
hqt"y g"nuv"46"j qwtu0Vj g{"y gtg"cong f"v"eqo g"v"y g"ndqtcvqt{"d{"dwu"qt"ftkxkpi"v"
 cxqkf"cp{"v{r g"qh"gzgtekg"r tkqt"v"vgvupi"kp"qtf gt"v"ucpf ctf kg"r j {ukecn'cevxxk\0Vj g{"
 y gtg"cuq"cong f"v"vng"y g"nh'kpugcf"qh'y g"ucltu0Rctvlekr cpw'y gtg"tcpf qo kgf"v"qpg"
 qh'y g'y tgg'hqmy kpi"eqpf kkpup<"

3+"Tguv"qp"e"ej ck'hqt"47"o kp"*Tguv+"

4+"E{eng"7"no"cv"72' "XQ4o cz"*E{enpi+"

5+"Y cm17"no"cv"e"ur ggf"qh"7"no g^{/3}"y kj"3' "lperkpcvqp"gs wxcrp v"v"59"Ö9" " "
 XQ4o cz"*Y cmkpi+"

Cm'eqpf kkpup'y gtg'hqmy gf"d{"7"o kp"tguv'cpf"d{"c"y q"j qwt"i nwequg'vgu0Vj g"qxgtxkgy "
 qh'y g'y tgg'r tqvqeqnu'ku'r tgugpvgf"kp'Hki wtg"980'



Hk wtg'90Qxgtxkgy "qh'yj g'yj tgg'f hgtgp'r tqveqni'.c.'d.'cpf "e0', Z"Y cw<1pvgpuk\ "dcugf " qp'yj g'XQ4'hqwpf 'f wtkpi 'yj g'uwdo czko cn'guv'qp'xkuk'30

Vj g'ej qugp'f kwcpeg'hqt"Y cmkpi "cpf "E {enkpi "y cu'ugv'cv'7"no "y j lej "y cu'dcugf "qp"wy q" etkgtlc<3+"yj g'cxgtci g'f kwcpeg'tcxgmf "q'y qtmld { 'tkr "rgpi yj "cpf "o qf g'lp'I tgcV'Dtkckp" *F gr ctvo gpv'hqt"Vtcur qtv'4235+"cpf "4+"yj g'f kwcpeg"tgs wktgf "q"cr r n\ "hqt"c"r ctnkpi " r gto k'cv'Qzhqtf "Dtqqngu'Wpkxgtuk\ "Qzhqtf "Dtqqngu'Wpkxgtuk\ "4236+0Ceeqtf kpi "q'yj g" pcvkqpcn'tcxgn'uwtxg { "eqpf wevgf "kp"4234."yj g'j ki j guv'r gtegpvc i g"qh'r gqr rg"*46' +y j q" wugf "y cmkpi ."e {enkpi ."qt"cnkpi "yj g'dwu'cu"o qf g'qh'tcpur qtv'eqo o wgf "cp"cxgtci g" f kwcpeg"qh'70"no "J qy 'r gqr rg'tcxgn'4235+0J qy gxgt."cu'yj g'f kwcpeg'tgs wktgf "q"cr r n\ " hqt"c"r ctnkpi "r gto k'cv'Qzhqtf "Dtqqngu'Wpkxgtuk\ "ku"@7"no "Rctnkpi "r gto k'qtf gt'hqto ." 4236+7"no "y cu'ugv'cu'yj g'cxgtci g'f kwcpeg'y j gtg'o quv'r gqr rg'y kn'o quv'rkngn\ "wug'yj g" dwu."dle {erg."qt'y cmkpi "cu"o qf g'qh'tcpur qtv'0Vj g'ur ggf "qh'7"no 0³ y cu'ugv'dcugf "qp'yj g" r tghgttgf "y cmkpi "ur ggf "qh'pqto cn'y gli j v'cf wmu"Dtqy plpi "gv'cn'04228+0"

7.3.5 Blood samples

Ecr knct{ " hpi gt/r tlen' dmqf " uco r ngu" y gtg" vngp" wulpi " c" ukpi rg/wug" rpekp i " u{ ugo " *Wpkleni5."Qy gp"O wphqtf."Y qqf uqem"WM+0Dmqf "i nweug"y cu'ko o gf kcyg" o gcuwtgf " wulpi "cp"cwqo c'le"dmqf "i nweug"cpn{ ugt"*I nweug"423- . "J go qewg"CD."Uy gf gp+0Vj g" ceewtce{ "qh"vj g"cpn{ ugt"y cu"ej gengf "f ckn{ "wulpi "c"eqpvtqmgf "uqnwkp0'Hqmqy kpi "vj g" o gcuwtgo gpv'qh'dmqf "i nweug."522"Un'qh'dmqf "y cu'eqmgev"fp"o letqckpgt"cpf "j grf "qp" leg"wpkri'egpvtkwi gf "cv'6222"tr o "hqt"32"o kpwgu0Dmqf "r ncuo c"y cu'r kr gwgf "cpf "uqtf gf "cv" /62ÅE" y j gtg" r ncuo c" kpuwkp" y cu" rvg" cpcn{ ugf " wulpi " grgestqej go knwo kpguegpeg" ko o wpqcuc{ "wulpi "cp"cwqo cvgf "cpn{ | gt "Eqdcu" G" 633."Tqej g" F kci pquku."WUC+0' Dmqf "uco r ngu"y gtg"vngp"cv"o kpwg"/7."2."37."52."67."82."; 2."cpf "342"hqmqy kpi "vj g" i nweug"ftkpn0' Vj g"i nweug"ftkpn' y cu" kpi gugf "y kj kp" vgp" o kpwgu"cv" o kpwg"2" cpf " eqpukugf "qh"472"o n'qh"y cvgt"o kzgf "y kj "72"i "qh"cxckrdng"ectdqj { ftcvg"qh"f gzvtqug" r qy f gt"*O { r tqvklp."Ej guj kg."WM+0'

"

7.3.6 Dietary standardisation

Kp"qtf gt"vq"ucpf ctf kug"hqf "kvcng."r ctvlekr cpw"tgegkxgf "r tg/r centi gf "o gcu"vj cv'y gtg" eqpuwo gf "qp"vj g"fc{ "dghqtg"gej "vlen'y kj "cp"wpko kgf "ceegu"vq"y cvgt0Vj g"fkv'i kxgp" y cu'uwdlgev'ur gekle."eqxgtkpi "vj gk"fcnk{ "gpgti { "cpf "pwtkgpv'tgs wktgo gpw"*Vj g"P wtkkqp" Uqelgv{ "422; +0Vj g"r tg/r centi gf "o gcu"eqpukugf "qh'eqtphrcngu."y j qrg"o km"y j kg"dtgcf." ej ggug." dwwgt." vqo cvq." r cuw." vqo cvq" ucweg." cr r rg." cpf " dpcpc0' Vj g" vqcn' gpgti { " tgs wktgo gpv'hqt"gej "r ctvlekr cpv'y cu'ecrewcvgf "wulpi "vj g"J cttku"cpf "Dgpgf lev'gs wcvkp" *J cttku" (" Dgpgf lev'3; 3: + "cpf "vj g"uj qtv" hqto "qh"vj g" Kvgtpcvkpcn' Rj { ulecn' Cevkxk{ " S wgunkppckg"*Eqo o kxgg"4227+"vq"f gygto kpg"vj gk"gunko cvgf "dcuci'o gvcdrke"tcvg"cpf " r j { ulecn'cevkkk{ "rgxgn'tgur gevkgxgn{ 0'Rctvlekr cpw'y gtg"cuugf "vq"dtkpi "cm'vj g"nghqxtu"vj g" hqmqy kpi "fc{ "kp"qtf gt"vq"o gcuwtg"vj gk"eqo r rkpeg"vq"vj g"fkv'i kxgp"dghqtg"vj g{ "y gtg" engctgf "vq"uctv0'

"

"

"

7.3.7 Statistics

Uc~~v~~uk~~ec~~ni~~c~~pcn~~{~~ugu"y gtg"r gthqto gf "wukpi "URUU"x044"*~~DO~~ "eqtr0"Cto qpm"P [."WUC+0'
Vj g" kpetgo gp~~en~~ ctgcu" wpf gt" vj g" i n~~ae~~qug" cpf " kpuw~~kp~~ ewt~~x~~gu" *I CWE" cpf " KCWE."
tgur ge~~v~~xgn~~{~~ "+" y gtg" e~~c~~re~~w~~rc~~v~~gf " wukpi " vj g" tcr gl q~~k~~f cn' o qf gn' *Hq~~q~~f " cpf " Ci t~~le~~w~~n~~wtg"
Qti cp~~k~~ c~~v~~kqpIY qtrf " J gcnj " Qti cp~~k~~ c~~v~~kqp." 3; ; : +0' Cm' f c~~v~~c" y gtg" pqto cm~~{~~ " f k~~u~~t~~k~~d~~w~~gf 0'
Tgr gc~~v~~gf "o gc~~u~~wtg"CP QXC"y kj "Dqph~~g~~ttqpk'e~~q~~ttg~~e~~v~~k~~qp"y cu"r gthqto gf "vq"v~~g~~uv"u~~c~~v~~u~~k~~ec~~ni'
uki p~~h~~kecpv' f h~~h~~gtgpegu" kp" I CWE" cpf " KCWE" dg~~y~~ ggp" vj g" vj tgg" eqpf k~~k~~qpu0' Uc~~v~~uk~~ec~~ni'
uki p~~h~~kecp~~e~~g"y cu"ugv'cv'p >'070Kp'cf f k~~k~~qp."vj g'EX' "qh'vj g'CWE'xc~~n~~gu"qd~~v~~ckpgf 'hqt"gej "
eqpf k~~k~~qp"y gtg"e~~c~~re~~w~~rc~~v~~gf "*EX"? "322"z"o gcp IUF +0'Uco r ~~n~~g"uk' g"y cu'e~~c~~re~~w~~rc~~v~~gf "dcugf "qp"
; 7' "r qy gt'cv'c'7' "ng~~x~~gn'qh'uki p~~h~~kecp~~e~~g"cpf "wukpi 'tgu~~w~~u'htqo "Tq~~d~~gtu'*et al.* "*4235+0'Vj g"
e~~c~~re~~w~~rc~~v~~kp" uwi i gu~~v~~gf " vj g" tget~~w~~ko gpv' qh' p~~k~~pg" r ct~~v~~ekr cpw=" j qy gxgt." vj tgg" o qtg"
r ct~~v~~ekr cpw'y gtg'tget~~w~~k~~g~~f "lp"ecug'qh'q~~w~~ndgtu0'

"

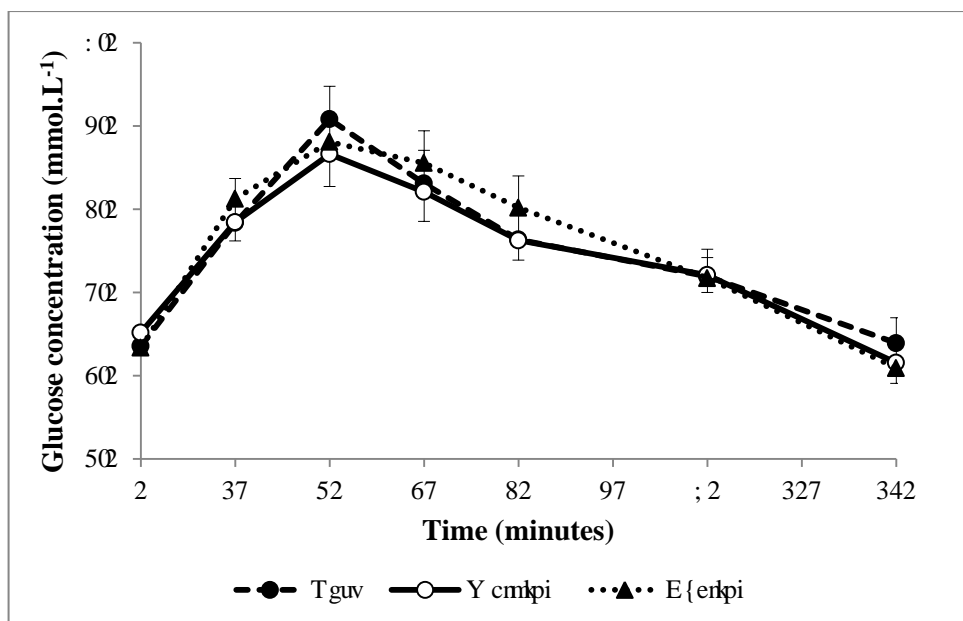
7.4 Results

Vj g"j k j guv'o gcp"EX' "qh'I CWE"cv'342"o k~~p~~w~~g~~u"y cu"q~~d~~ugt~~x~~gf "dg~~y~~ ggp"Tu~~v~~"cpf "
Y cm~~k~~pi "*52' +h~~q~~m~~y~~ gf "d{ "Y cm~~k~~pi "cpf "E {en~~k~~pi "eqpf k~~k~~qpu"*48' +."y j k~~g~~"vj g"xct~~k~~cd~~k~~kv~~{~~ "
dg~~y~~ ggp"Tu~~v~~"cpf "E {en~~k~~pi "y cu"vj g"m~~y~~ guv"*47' +0'Qp"vj g"q~~v~~j gt"j cpf."vj g"j k j guv'o gcp"
EX' "qh'vj g'r~~n~~uo c"KCWE"y cu"q~~d~~ugt~~x~~gf "dg~~y~~ ggp"Y cm~~k~~pi "cpf "E {en~~k~~pi "*4: ' +h~~q~~m~~y~~ gf "
d{ "Tu~~v~~"cpf "Y cm~~k~~pi "*46' +."y j k~~g~~"vj g"xct~~k~~cd~~k~~kv~~{~~ "dg~~y~~ ggp"Tu~~v~~"cpf "E {en~~k~~pi "y cu"vj g"
m~~y~~ guv"*36' +0'

Vj g"v~~o~~ g"eqwtug"qh'd~~n~~q~~f~~ "i n~~ae~~qug"cpf "r~~n~~uo c"l~~p~~uw~~kp~~"f wt~~k~~pi "vj g"i n~~ae~~qug"v~~g~~uv'wpf gt"cm'
eqpf k~~k~~qpu"ku'r tgu~~p~~v~~g~~f "kp"Hi wtg"904"cpf "905."tgur ge~~v~~xgn~~{~~ 0'Vj g'I CWE"cpf "KCWE"cv'82"
cpf "342"o k~~p~~w~~g~~u"ht"cm'eqpf k~~k~~qpu"ecp"dg"uggp"kp"Vcd~~r~~g"9040P q"u~~c~~v~~u~~k~~ec~~ni~~{~~ "uki p~~h~~kecpv'
gh~~h~~gev'y cu'f g~~v~~ge~~v~~gf "dg~~y~~ ggp"cm'eqpf k~~k~~qpu0J qy gxgt."c'tgpf "y cu"q~~d~~ugt~~x~~gf "lp"dq~~v~~j "I CWE"
cpf "KCWE"ch~~g~~t"Y cm~~k~~pi 0'Vj g'I CWE"cpf "KCWE"y gtg'tg~~f~~ weg~~f~~ "d{ "42' "ch~~g~~t"342"o k~~p~~w~~g~~"
eqo r ct~~g~~f "vq"Tu~~v~~0"

"

"

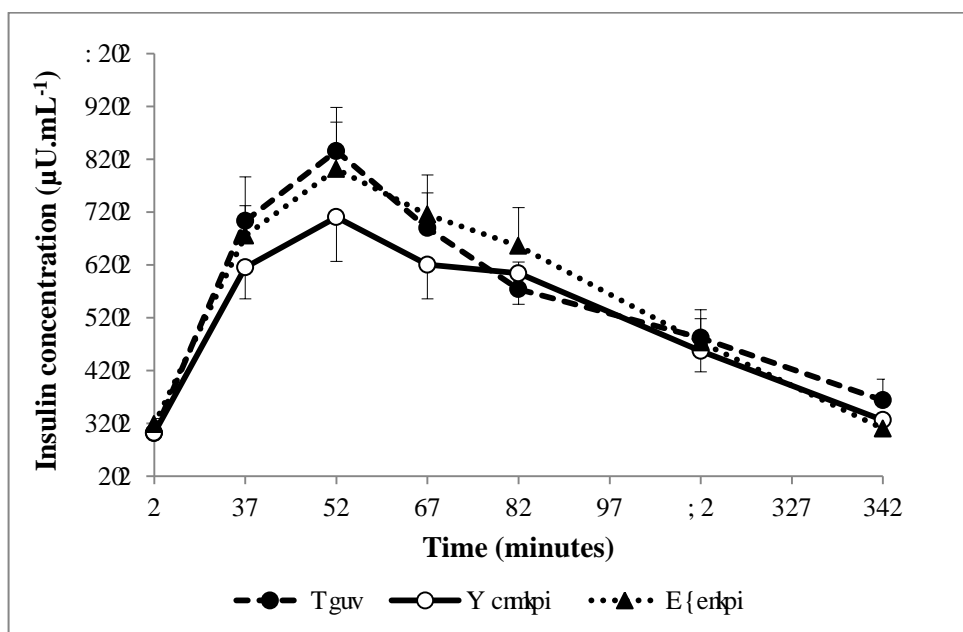


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y cmkpi ."cpf "e{erkpi "eqpf kkpup0Xcmvgu"ctg"o gcp"Ö'UGO 0'

"

"



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tguv."y cmkpi ."cpf "e{erkpi "eqpf kkpup0Xcmvgu"ctg"o gcp"Ö'UGO 0'

"

Vcdrg'9040Rcuo c'i nweug'cpf'lpurk'ctgc'wpg'gt'yj g'ewtxg'f wtkpi '82'o kp'cpf'342'o kp' qh'yj g'4/j qwt'i nweug'guy'hmgy kpi 'gkj gt'tguy'y cmkpi 'qt'twppkpi "

"	I CWE'‰ o qnN ³ +		KCWE'‰Wb N ³ +	
	82o kp"	342o kp"	82o kp"	342o kp"
Tguy'	3240'Õ'790"	37: 0'Õ'3270"	4374'Õ'; 92"	53; 9'Õ'3763"
Y cmkpi "	: 60'Õ'6504"	3480 'Õ'930"	3899'Õ': 7: "	4769'Õ'35: 7"
E {erkpi "	32604'Õ'5: 0"	3750'Õ'970"	424: 'Õ': ; 5"	4; 54'Õ'3784"

I CWE<i nweug'ctgc'wpg'gt'yj g'ewtxg=KCWE<lpurk'ctgc'wpg'gt'yj g'ewtxg0Xcngu'ctg" o gcp'Õ'UF 0p"@27'ht'I CWE'cpf'KCWE'cv'82'o kp'cpf'342'o kp'dgy ggp'eqpf kkpup0'

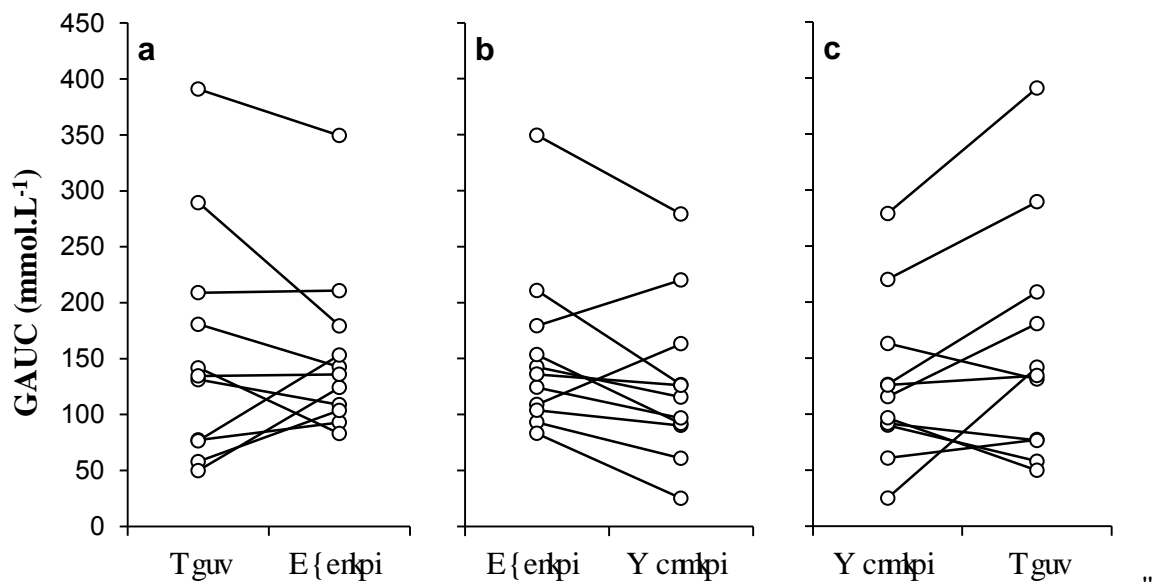
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"

"



Hk wtg'9060Rckgf'f cv'qh'yj g'lpetgo gpvcdmqf'i nweug'ctgc'wpg'gt'yj g'ewtxg'dgy ggp'cm' eqpf kkpup0*c+Tguy'vs.'e {erkpi 0*d+E {erkpi 'vs.'y cmkpi 0*e+Y cmkpi 'vs.'tgu0'

7.5 Discussion

Cu'r ctv'qh'vj g'r tg/vguv'r tgr ctv'kqp'r g'kqf. 'uwdlgeu'r ctv'ekr c'v'kpi 'lp'I Kuwf lgu'ctg'cungf 'v' cxqkf 'utgpwqwu'gzgtekug'lp'vj g'46'j qwtu'dghqtg'vj g'v'gu0J qy gxgt. 'k'ku'pqv'npqy p'y j g'vj gt' y j g'o qf g'qh'v'c'pur q'tv.'hqt'gzco r'ng'eqo kpi 'd{' 'd'wu' *t'guv'v'q' qpg'x'kuk'v'cpf 'e{er'kpi 'qt' y c'm'kpi 'v'cp'q'vj gt'x'kuk'v'j cu'cp{' 'gh'geu'v'qp'dm'qf 'i n'equg'qt'lp'uwr'k'p'rg'x'gnu'cpf 'j g'peg'I K' Vj g'r t'gugp'v'uwf {' 'y cu' vj g'tgh'qtg'f gu'k' pgf 'v' f'gv'to k'pg' vj g' gh'geu'v'qh'cewg'gzgtekug' *y c'm'kpi 'cpf' 'e{er'kpi '+' r't'kqt'v'q' I K'v'gu'kpi 'qp' vj g'y k'j k'p/uwdlgeu'v'xct'kcd'k'k'v{' 'qh'dm'qf 'i n'equg'cpf 'lp'uwr'k'p't'gur qp'gu0"

Vj g'ewt'g'p'v'uwf {' 'h'q'w'f'v'j cv'vj g'EX' 'qh'I CWE'd'gy g'gp'T'guv'cpf 'E{er'kpi 'y cu'48' " y j k'g'vj g'EX' 'd'gy g'gp'E{er'kpi 'cpf'Y c'm'kpi 'y cu'47' 0Vj g'ug't'guw'u'ctg'y k'j k'p'vj g'f'c{/ v'q/f'c{' 'xct'kcd'k'k'v{' 'qh'I CWE'q'd'ug't'x'gf'lp'g'ct'r'k'g't'uwf l'gu'y k'j 'c'EX' 'qh'44/4; ' *Y k'k'co u' g'v'cr'0'422: =Y q'rg'x'gt'g'v'cr'0'3; : 7.'4225-0J qy gxgt.'vj g'EX' 'd'gy g'gp'T'guv'cpf 'Y c'm'kpi 'gzeg'gf'gf'v'j g'ceeg'r'cd'rg'rg'x'gn'qh'xct'kcd'k'k'v{' 'hqt't'gh'gt'g'peg'h'q'f'qh'52' " *k'p'v't'p'c'v'k'p'c'n' U'c'p'f'c't'f'u'Q'h'h'eg'4232-0Vj g't'gh'gt'g'peg'h'q'f'."w'uw'cm{' 'i n'equg'qt'y j k'g'dt'g'cf'."ug't'x'gu'cu'c" t'gh'gt'g'peg'r'q'k'p'v'y j g't'g'q'vj gt'h'q'f'u'v'guv'h'q'f+'ct'g'o g'cuw't'gf'ci c'k'p'u'v'k'0Vj g'r'cti g'y k'j k'p/uwdlgeu'v'xct'kcd'k'k'v{' 'hqt'v'j g't'gh'gt'g'peg'h'q'f'ecp'f'get'g'cug'v'j g'ceew't'ce{'." r't'g'ek'k'q'p'." cpf' t'gr't'q'f'w'ek'd'k'k'v{' 'qh'I K'*D't'q'w'p'u'g'v'cr'0'4227-0K'p'v'j k'u'uk'w'c'v'k'p'p'."t'g'ug'c't'ej'g't'u'y k'n'g'k'y'gt'3+'p'g'gf'v'q'r'g't'h'q'to 'c'v'j k'f'v'guv'qh'vj g't'gh'gt'g'peg'h'q'f'lp'ec'ug'q'p'n{' 'v'y q'y g't'g'eqo r'ng'v'f'."4+'t'gr'g'cv'v'j g'v'guv'v'j cv'ku'k'p'eq'p'uk'w'g'p'v'y k'j 'v'j g'q'vj gt'v'y q'v'guu'lp'ec'ug'v'j t'gg'y g't'g'eqo r'ng'v'f'."qt'5+' g'zen'f'g' uwdlgeu'v'y k'j " r'cti g'xct'kcd'k'k'v{' " *k'p'v't'p'c'v'k'p'c'n' U'c'p'f'c't'f'u' Q'h'h'eg' 4232-0 Vj g'r't'ce'v'ek'n'k'o r'k'ec'v'k'p'qh'v'j k'u'k'u'v'j g'k'p'et'g'cug'lp'v'j g'co q'w'p'v'qh'v'gu'k'p'i 'qt'r'ct'v'ek'r'c'p'u' t'gs'w'k'gf'v'q'i'g'v'o q't'g'ceew't'c'v'g'I K'x'c'm'g'u0"

Vj g'I K'x'c'm'g'qh'vj g'v'guv'h'q'f'eq'w'f'c'n'q'd'g'ch'ge'v'f'd{' 'v'j k'u'r'cti g'xct'kcd'k'k'v{' 'lp'c'uk'w'c'v'k'p'p' y j g't'g'y c'm'kpi 'ku'w'ug'f'cu'c'o qf g'qh'v'c'pur q't'v'f'w'k'p'i 'vj g'v'guv'h'q'f'cpf 'vj g'd'wu'f'w'k'p'i 'vj g't'gh'gt'g'peg'h'q'f'v'gu'k'p'i 0H'qu'v'g't/R'q'y g'm'c'p'f'eq'ng'ci w'gu'*H'qu'v'g't/R'q'y g'm'g'v'cr'0'4224+'r't'g'ug'p'v'f'cp'gzco r'ng'h'q'o 'c'uw'f{' 'y j g't'g'v'j g'uc'p'f'c't'f'g'tt'qt'qh'vj g'I K'q'h'ectt'q'w'y cu'420'O c'p{' 'h'ce'v'q'tu'eq'p'v'k'd'w'g'v'q'v'j k'u'y k'f'g'o c'ti k'p'qh'g'tt'qt'k'p'en'f'k'p'i 'r'q'qt'uc'p'f'c't'f'k'uc'v'k'p'p'cpf 'ku'gh'geu'v'd'geq'o gu'gx'gp'o q't'g'r't'q'p'q'w'peg'f'y j g'p'c'uo c'n'p'wo d'gt'qh'uwdlgeu'v'ct'g'k'p'en'f'gf'lp'I K' uwf l'gu'*p?": /34+'*D't'q'w'p'u'g'v'cr'0'4227=Y q'rg'x'gt'."l'g'p'n'k'p'u'."Q'ec'p'c'."T'c'q'."("E'q'm'k'g't'."3; : : =Y q'rg'x'gt'g'v'cr'0'4225-0'

O gcp "I CWE"cpf "KWE"y gtg"cr r tqzko cvgn{ "42' "mgy gt"chgt"Y cmkpi "eqo r ctgf "vq" T guv." cnj qwi j "vj ku'f khtgpeg"y cu'pqv'ucv'kuecm{ "f khtgpgv'Vj gug"t guwmu"vj gt ghqtg"pggf "vq"dg" kpvt r tgvf "y kj "ecwkp0C"dk i gt"uco r ng'uk'g'o ki j v'dg"pggf gf 0P gxgtvj gnguu."Dqpgp"cpf " eqmgci wgu" *Dqpgp" gv' cr0' 3; ; : + "uj qy gf "uko kct" tgf wevqp" qh' 38' "kp" I CWE" dw" pq" f khtgpeg"kp" KWE" chgt"mgy "kpvgpukv{ "gzgtekg"eqo r ctgf "vq"t guw' Vj gug" hkp f kpi u" ctg" uwr r qtvgf "d{ "r t g x k q w u' u w f k g u' y j q' u j q y g f " y c v' c' u k p i n g' d q w' q h' g z g t e k u g' l o r t q x g u' l p u w k p" ugpuksxkx{ "kp" o wuergu" *l qwpi "gv' cr0' 3; ; : = J c{ cuj k' gv' cr0' 4227+ "ngcf kpi "vq" c" tgf wegf " kpurkp" t gur qpug" *l qwpi "gv' cr0' 3; ; : = Dgp/Gl tc" gv' cr0' 3; ; : 7+ "cpf "ko r tqxgf" i nwequg" vqrgtcepg" *Dqpgp" gv' cr0' 3; ; : = J c{ cuj k' gv' cr0' 4227+0J qy gxgt. "qvj gt" u w f k g u' j c x g' c n u q" u j q y p" e q p t c f k e v t { " t g u w m u' o c k p n { " c h g t' j k i j " k p v g p u k v { " g z g t e k u g' * T q u g' g v' c r 0' 4 2 2 3 = P c | c t" g v' c r 0' 3; ; : 9 = M k p i " g v' c r 0' 3; ; : 7 + 0' Q p g' k p v t g u k p i " h k p f k p i " h t q o " v j g' e w t t g p v' u w f { " y c u' v j c v' u w d l g e w' y k j " c' I C W E" c d q x g' 3 6 2 " o o q r 0' N³ " f w t k p i " T g u v' e q p t k d w g f " v q' v j g' n c t i g u v' f k h g t g p e g u' k p' I C W E' d g y g g p' T g u v' c p f " Y c m k p i " e q p f k k q p u' c o q p i u v' c n l' u w d l g e w' 0' K' u g g o u" r q u k l d n g' v j c v' v j g' t g u v' q h' v j g' u w d l g e w' * g z e g r' v' p p g' + y j q' j c f " c' m y " I C W E' c v' T g u v' * d g m y " : 2" o o q r 0' N³ + j c f " r k w g' t q q o " h q t' k o r t q x g o g p v' k p' i n w e q u g' v q r g t c p e g' 0' Q p' v j g' q v j g t' j c p f. " v j g' f k h g t g p e g u' k p' I C W E' h q t' v j g' u c o g' u w d l g e w' y g t g' n g u' r t q p q w p e g f " d g y g g p' E { e r k p i " c p f " T g u v' 0' C' r q u k l d n g' g z r n c p c v k p' h q t' v j k u' o k i j v' d g' v j c v' c n j q w i j " e { e r k p i " j c f " c' u r k i j v { " j k i j g t" k p v g p u k v { " v j c p" y c m k p i " * 7 2' " X Q 4 0 c z" v s. " 5 9" O' : ' " X Q 4 0 c z. " t g u r g e v k x g n { + " k v' y c u' u k i p k h e c p v { " u j q t v g t' * 8 2 o k p' h q t' y c m k p i " c p f " 3 6 o k p' h q t' e { e r k p i + 0' K' e q w f " d g' c t i w g f " v j c v' v j g' v q c n' g p g t i { " g z r g p f k w t g' y j k e j " y c u' j k i j g t' f w t k p i " Y c m k p i " e q o r c t g f " v q' E { e r k p i " n g f " v q' v j g' r t q p q w p e g f " g h g e v' q h' Y c m k p i 0' K' j c u' d g g p' u j q y p' v j c v' g p g t i { " g z r g p f k w t g' t c v j g t" v j c p' k p v g p u k v { " j c u' o q t g' k o r c e v' q p' k p u w k p' u g p u k s x k x { " * D t c w p' g v' c r 0' 3; ; : 7 + 0' l g v' q p g' r q u k l d n g' g z r n c p c v k p' c u' v q' y j { " p q' u c v' k u e c m { " u k i p k h e c p v' f k h g t g p e g' d g y g g p' Y c m k p i " c p f " v j g' v y q" q v j g t' e q p f k k q p u' y c u' t g c e j g f " o k i j v' d g' v j g' n c t i g' u c p f c t f " f g x k c v k p' y j k e j " t g f w e g u' v j g' g z r g t k o g p v c n l' r q y g t' q h' v j g' u w f { 0"

"

7.6 Conclusion

F gur kg"pqv' hkp f kpi "cp{ "ucv'kuecm{ "uki p k h e c p v' f k h g t g p e g u' d g y g g p' v j g' v j t g g' e q p f k k q p u." v j g' h k p f k p i u' q h' v j k u' u w f { " u w i i g u v' v j c v' r c t v e k r c p w' u j q w f " c x q k f " e j c p i k p i " v j g' o q f g' q h' v t c p u r q t v' d g y g g p' x k u k u' g u r g e k c m { " y c m k p i " v q' v j g' n c d q t c v q t { " q p' v j g' o q t p k p i " q h' v j g' v g u v' k h' c p { " q v j g t' o q f g' q h' v t c p u r q t v' y c u' w u g f " q p' v j g' q v j g t' v g u k p i " f c { u' 0' K' g c m { " u w d l g e w' u j q w f " d g' c u n g f " v q' w u g' v j g' u c o g' o q f g' q h' v t c p u r q t v' k p' q t f g t' v q' t g f w e g' v j g' y k j k p' u w d l g e v' x c t k c d k k v { "

dgwy ggp" I K'vuwu0'k'p" qtf gt" vq" kpuwtg" eqo r ncpeg. "tgugcte j "r ctvlek cpw" ecp" dg" cunf "vq"
 eqo g'd { "dwu" cpf "tgko dwugf "w qp" uj qy kpi "vj g" dwu" kengv0'

Chapter 8

Conclusion and future prospects

8.1 General conclusion

Tgugctej "uwf lgu"kp"ur qtv'uekgpeg"qhngp"j cxg"cuo cm'uco r ng"uk g"y j lej "o cngu"ku'o qtg" f hkewn"vq" f gvev"uo cm'uki phkecpv"ej cpi gu"kp"gz gtekug"r gthqto cpeg."r j {ukqmi lecn'cpf " dkqmi lecn'r ctco gvgtu'K gcm{."cm'gz vcpqwu'xctkdngu"uj qwf "dg'grko kpcvgf "qt"o kpk kugf " kp" qtf gt" vq" tgf weg" vj gk" ko rcev" qp" vj g" tguwmu" qh" vj g" uwf {0' Vj ku" ku" cej kxgf " d{ " ko r ngo gpvpi "ucpf ctf kucvqp" r tqveqn" uwej "cu" vguvpi "cv" vj g" uco g" vko g" qh" vj g" f c{." r ctvlekr cpw"eqpuwo kpi "vj g"uco g"co qwpv"qh" hqqf "cpf" r gthqto kpi "vj g"uco g" vclvpi "46/ j qwtu'r tkt "vq" gxt { "vclvpi" f kvct { "xctkdkrk{ "kp" uwdlgevu"r tgr ctvqp" ku" c" r qvvpvclv"uqwtg" qh"gttqt"kp"tgugctej "uwf lgu"vj cv'o c{ "phwpeg"r tko ct{ "o gcuwtgo gpv'd{ "kpetgcukpi "uki pcn' pqlug"cpf "tgf wvpi "gxr gko gpvcl' qy gt "Dtcwp"("Dtqmu"422: =Lgceqeng"("Dwtng"4232+0' O cp{ "f kvct { "eqo r qpqp'v' tgs vkt g" f kvct { "ucpf ctf kucvqp"cu"vj g{ "j cxg"dggp"uj qy p"vq"cngt" gz gtekug"r gthqto cpeg"cpf "r j {ukqmi lecn'gur qpugu'Vj gtghqg."vj g"r tgugpeg"qh"qwwktu"cpf " r ctvlekr cpw"y kj "r qqt"eqo r rkepeg"vq"vj g" f kvf kxgp"ecp"chgevtgugctej gtu"cdkrk{ "vq" f gvev" ucvkuecm{ "uki phkecpv"ej cpi gu'J qy gxt."k"ecp"dg"eqpenf gf "htqo "vj g" rkgtcwtg"vj cv" vj gtg" ku" pq" uwhkecpv" kphqto cvqp" kp" vj g" ctgc" qh" f kvct { "ucpf ctf kucvqp" vq" i vkf g" tgugctej gtu"kp"vj gk"uwf { "f guki p'Gxgp"vj g" f kvct { "ucpf ctf kucvqp"o gvj qf u'ewtgpv{ "wugf " j cxg"pqv'dggp"y gm'uwf kfg { "gv'ht"gzco r ng."vj g"tgr tqf vekdkrk{ "qh"vj g"ug"o gvj qf u'cpf "vj g" eqo r rkepeg"tcvg"qh"r ctvlekr cpw"vq"vj g"kpustvekvpu"i kxgp"d{ "tgugctej gtu"vkn'pggf "vq"dg" gzco kpgf 0'

Vj ku"vj guku'dgi cp"d{ "kf gpvh{ kpi "vj g" f kvct { "ucpf ctf kucvqp"cr r tqcej gu"ewtgpv{ "wugf "vq" eqpvtqn'f kvct { "kpcng"r tg/gxr gko gpvcl'vclv'Vj ku'tgxky "gzco kpgf "cm'r wcluj gf "uwf lgu" vj cv"ko r ngo gpvgf "cp"cewg"kvgtxgpvqp" r tqveqn'kp"vy q"ur qtu"pwtvkvqp"lqwtvclv"htqo " 422: "vkvcl'42360'Vj g'tgxky "r tqxkf gf "cp"kf gc"cdqw"vj g"pwo dgt"qh'tgugctej gtu"y j q"ctg" r wvpi "ghqtv'lvq"ko r ngo gpvpi "j ki j "s wclv{ "f kvct { "ucpf ctf kucvqp"vgej pls wgu'kvpgcf "qh" o qtg"r tceveclv'dw"mgy "s wclv{ "vgej pls wgu'K'y cu"uwtr tkulpi "vq" hpf "vj cv'67' "qh'uwf lgu" hclv{ "vq"ucpf ctf kug" f kvct { "kpcng"*qt"vq"tgr qtv'kv"kp"vj g"r tg/vclv"r tgr ctvqp"r gtlkf 0' Vj ku"eqwf "dg" f vg"vq"vj g"uo cm'pwo dgt"qh'tgxky u'f kuewukpi "vj g"ko r qtvpeg"qh" f kvct { "ucpf ctf kucvqp" cpf "uwf lgu" vj cv" kpxguki cvg" vj g"eqpugs wgegu"qh" r qqt"ucpf ctf kucvqp" y j gp"ucpf ctf kucvqp"y cu"tgr qtvf 0'Hqqf "tgeqt"y cu"hwfp "vq"dg"tgugctej gtu"r tghgtgf " cr r tqcej "cpf "vj ku"ku"o qtg"rkn{ "vq"dg" f vg"vq"ku"mgy "dwf gp"qp"dqv "r ctvlekr cpw"cpf " tgugctej gtu'Y j gtgc."vj g" dguv'cr r tqcej "ucpf ctf kug" f kvv"y cu"qp{ "wugf "kp"cuo cm' pwo dgt"qh'uwf lgu'Vj ku'tgxky "y kn'j gr "hwwt g"uwf lgu"vq"kf gpvh{ "vj g"ctgc"vj cv'tgs vktg" hwtj gt" kpxguki cvqp"uwej "cu"vj g" f kvct { "cuuguu gpv"vgej pls wgu"vj cv'ctg"htgs wgpv{ "wugf "

dw'pqv' { g'v'hw' { "g'zr'rtgf" d { "t'gugctej'gtu'0'Vj'ku'tgxkgy' "cnuq" j'ki'j'rk'j'vgf' "y'g'pggf' "v' "u'ctv' ej'genkpi' "hqt" eqo'r'k'cpeg' "kp" qtf'gt' "vq" o'cng' uwt'g' y'cv' y'g' f'k'htgpeg' "kp" gpgti' { "cpf" o'cetqpwtkgpv'k'pvcngu'dgwy'ggp' "v'k'cni'ku'o'k'plo'c'f0"

T'gugctej'gtu'o'c' { "j'cxg'dggp'v'cnkpi' "f'kgvct' { "ucpf'ctf'kuc'v'kqp' "hqt" i' t'cpvgf' . "cuuwo'kpi' "y'cv'y'g' o'gy'qf'u'ewt'g'p'v' { "wugf' "ctg" r'tq'x'k'f'kpi' "cp" c'ee'gr'v'cdng' r'gx'gn'q'h'eqp't'qn'q'x'gt' "y'g'f'kgvct' { "eqo'r'qpg'p'u'0'Vj'ku'eqw'f' "dg" f'w'g' "vq" y'g' r'c'eni'q'h'u'w'f'k'gu'qp' "y'g' t'gr'tqf'w'ek'd'k'k'v' { "q'h'f'kgvct' { "ucpf'ctf'kuc'v'kqp" o'gy'qf'u' c'x'c'k'cdng'0' Vj'gt'gh'qt'g. "y'g' t'gr'tqf'w'ek'd'k'k'v' { "q'h' y'tgg' f'kgvct' { "ucpf'ctf'kuc'v'kqp' "v'ej'p'k's'w'gu' *F_{tgecm} . "H_{geqtf} . "cpf' "ucpf'ctf'kugf' "f'kgv'y'cu'g'z'co'k'p'gf' "k'p'c'y'ng'v'u'0' Vj'g'u'w'f' { "t'g'x'g'c'ngf' "y'cv'k'o'r'q't'v'p'y'k'j'k'p'u'w'd'g'ev'f'k'htg'p'egu'y'cu'c'r'r'ct'g'p'y'k'j' "c'EX' "hqt" gpgti' { "cpf" o'cetqpwtkgpv'k'pvcngu'dgwy'ggp' "5/8' "hqt"ucpf'ctf'kugf' "f'kgv' "32/3; ' "hqt" H_{geqtf} . "cpf' "9/34' "hqt" F_{tgecm} 0'K' y'cu'eqp'ew'f'gf' "y'cv' y'g'ucpf'ctf'kugf' "f'kgv'ku' y'g'dguv' c'r'r'tq'cej' "v'eqp't'qn'f'kgvct' { "k'pvcng'cpf' "o'w'u'v'd'g'wugf' "y'j'g'p'f'kgv'j'cu'c'i't'g'cv'k'p'hw'gpeg'qp' "y'g'k'p'v'g't'x'g'p'v'kqp" q't'r'g't'h'q'to'c'peg'cpf' "cp" g'p'j'c'pegf' "t'g'r'k'cd'k'k'v' { "ku't'g's'w'k't'gf' "f'w'g' "vq" y'g'uo'c'm' g'z'r'g'ev'g'f' "g'h'g'ev'0'Vj'ku'u'w'f' { "r'tq'x'k'f'gf' "i'w'k'f'c'peg'v'q' "h'w'w'g't'gugctej' "u'w'f'k'gu'qp' "y'j'k'ej' "o'gy'qf' "eqw'f' "dg' "u'w'k'cdng' "hqt" y'g'f'g'uk'i'p'q'h'y'g'u'w'f' { 0'H'qt'g'z'co'r'ng. "y'g'ucpf'ctf'kugf' "f'kgv'o'w'u'v'd'g'wugf' "y'j'g'p'f'kgv'j'cu'c'i't'g'cv'k'p'hw'gpeg'qp' "y'g'k'p'v'g't'x'g'p'v'kqp" q't'r'g't'h'q'to'c'peg'0'K' "c'f'f'k'k'qp. "y'j'g'p' "y'g'g'z'r'g'ev'g'f' "g'h'g'ev'ku'uo'c'm'cpf' "cp" g'p'j'c'pegf' "t'g'r'k'cd'k'k'v' { "ku't'g's'w'k't'gf' 0'Y'j'gt'g'cu. "F_{tgecm} "cpf' "H_{geqtf} "v'ej'p'k's'w'gu'uj'q'w'f' "dg'wugf' "y'j'g'p' "r'ti'g' "g'h'g'ev'ku'g'z'r'g'ev'g'f' "cpf' "y'g'f'kgv'j'cu'm'y' "k'o'r'c'ev'qp' "y'g'k'p'v'g't'x'g'p'v'kqp0

Vj'g't'g'cn'ej'c'm'gpi'g'y'cu'v'q'r'tqr'qug'c'o'gy'qf' "y'cv'pqv'qp'v' { "j'cu'm'y'gt' "x'ct'k'cd'k'k'v' { "dw'cnuq" h'gy'gt' "f'kuc'f'x'c'p'ci'gu' "y'cp' "y'g'dguv'v'ej'p'k's'w'g' "y'cv'ku'ewt'g'p'v' { "c'x'c'k'cdng'0'Vj'gt'g'y'cu'w'y'q' "qr'v'k'pu. "g'k'j'gt' "eqo'g'w'r'y'k'j' "c'v'q'cm' { "p'gy' "eq'p'egr'v'qt' "k'o'r't'q'x'g'c'ewt'g'p'v'o'gy'qf' 0'K'ku'c' "dgw'gt' "f'g'ek'uk'qp'v'q' "k'o'r't'q'x'g'y'j'cv'j'cu'c'nt'g'cf' { "d'ggp'uj'q'y'p'v'q' "dg'y'g'dguv'cpf' "o'cng'k'v'g'x'gp" dgw'gt'0'Vj'gt'gh'qt'g. "y'g'f'g'ek'uk'qp'y'cu'v'cng'p'v'q' "r'tqr'qug'cpf' "cu'gu'ug' "y'g't'gr'tqf'w'ek'd'k'k'v' { "q'h' r'k's'w'k'f' "k'p'uv'g'f' "q'h'u'q'r'k'f' "r't'g/r'c'eni'gf' "o'g'cnu'k'p'c'y'ng'v'u'0'Vj'g'r'k's'w'k'f' "f'kgv'y'cu'h'q'w'p'f' "v'q' "dg'cp" g'h'g'ev'x'g'v'ej'p'k's'w'g'v'q' "ucpf'ctf'kug'f'kgvct' { "k'pvcng'y'k'j' "c' "u'rk'i'j'v' { "dgw'gt' "t'gr'tqf'w'ek'd'k'k'v' { "y'cp" y'g'U'q'f'kgv'0'Vj'g't'gf'w'egf' "eq'u'v'cpf' "v'k'o'g'q'h'r't'gr'c't'c'v'k'qp" o'c'f'g'y'g'r'k's'w'k'f' "r't'g/r'c'eni'gf' "o'g'cnu'v'ej'p'k's'w'g" o'q't'g't'gugctej' "t'k'g'p'f'n' { "y'cp' "y'g'v't'c'f'k'k'q'p'c'n'u'q'r'k'f' "f'kgv'y'cv'r'w'j'k'j' "d'w't'f'g'p'qp" t'gugctej'gtu'0'K' "y'g'k't' "x'g't'd'c'n' "h'gg'f'd'c'cm' "r'c't'v'ek'r'c'p'u" t'gr'q't'v'g'f' "y'cv' y'g'r'k's'w'k'f' "f'kgv'y'cu'cp" w'p'w'u'w'c'n'g'z'r'g't'k'g'peg'j'q'y'g'x'gt. "y'g' { "y'q'w'f' "p'q'v'o'k'p'f' "h'q'm'y'k'pi' "u'w'ej' "f'kgv'h'qt' "3/4" f'c' { "u'k'p'c" t'gugctej' "u'w'f' { 0'Vj'gt'gh'qt'g. "r'k's'w'k'f' "r't'g/r'c'eni'gf' "o'g'cnu'eqw'f' "cnuq'dg'wugf' "y'j'g'p'f'kgv'j'cu'c' i't'g'cv'k'p'hw'gpeg'qp' "y'g'k'p'v'g't'x'g'p'v'kqp" q't'r'g't'h'q'to'c'peg'cpf' "y'j'g'p' "y'g'g'z'r'g'ev'g'f' "g'h'g'ev'ku'uo'c'm'cpf' "cp" g'p'j'c'pegf' "t'g'r'k'cd'k'k'v' { "ku't'g's'w'k't'gf' 0'

Dcugf "qp"vj g"tguwu"qh"vj g"ktuv"uwf { "Ej cr vgt "4+."vj g"v{r lecn'uwldgev'y cu'hqwpf "vq"rkngn{ " xct { "vj gkt"ectdqj { ftcvg"lpvcng"d { "37' "qt"o qtg"dgw ggp"vy q"gzr gtko gpvcl'tkcn0Y j cv'y g" dgrkxgf "vq"dg"cp"guugpvcl'n's wguvqp"vq"cpuy gt"y cu"y j gvj gt" c"37' "f khtgtpgeg"kp"vj g" ectdqj { ftcvg"lpvcng"j cu"cp { "ghge'v"qp"gpf wtcepg'r gthqto cpeg"cpf "r j { ukqmi lecn'tgur qpug" qt"pq0Vj g'o clp"qweqo g"qh"vj ku'uwf { "y cu"vj cv'c"37' "f khtgtpgeg"kp"46/j qwt"ectdqj { ftcvg" lpvcng" f kf " pqv" uki phlecpv { " chge'v" gpf wtcepg" ecr cekv { . " pwtkgpv" qz kf cvkqp" cpf " dmqqf " i nweugl'recvg"ngxgn"lp"vtclpgf "e { erkuu0J qy gxgt. "cv"vj g"ngxgn'qh"vj g"lpf kxkf wcn'uwldgev. " vj gtg'o c { "ukm'dg" c'r qvgpvcl'n'ghge'v'qh'ectdqj { ftcvg"lpvcng"dww'uwej "cp"ghge'v'o c { "dg { qpf " vj g'gej plecl'n'tgekukqp"qh"vj g'o gcuwtgo gp0K'ku'ko r qtcvpv"vq"pqvg"vj cv'72' "qh'r ctvlekr cpwu" y j q" wugf "F tgecm"vq"ucpf ctf kug" f lgvct { "lpvcng"j cf " c" mti gt" xctcdkkr { "vj cp"37' 0' Vj g" uo cmguv'f khtgtpgeg"kp"ectdqj { ftcvg"vj cv'eqwf "j cxg"cp"ko r cev'qp"gpf wtcepg'r gthqto cpeg" cpf "r j { ukqmi lecn'tgur qpugu"j cu" { gv"vq"dg"kf gpvklgf 0'

Vj g" hqwtvj " uwf { " y cu" f guki pgf " vq" o gcuwtg" vj g" kpekf gpeg" qh" r ctvlekr cpwu" y j q" y gtg" j { r qj { ftcvgf "qp"vj gkt"cttkxcn"vq"vj g"ndqtcvqt { "chgt"tgegkxkpi "gpeqwtci go gpv"vq"uvc { " y gmj { ftcvgf 0O quv'ko r qtcvpv { . " r ctvlekr cpwu" y gtg"pqv'vqrf "cdqww'vj g'tgcn'cko "qh'vj g'uwf { " cpf "vj cv'vj gkt"eqo r rkepeg"y cu"dgkpi "o qpkkqtf 0'Vj g'o quv'ko r qtcvpv"lpf kpi "y cu"vj cv'qpg" vj kf "qh"r ctvlekr cpwu" y gtg"uki phlecpv { "j { r qj { ftcvgf "qp"vj gkt"cttkxcn"vq"vj g"ndqtcvqt { 0' Vj ku'eqphko u"vj cv'gpeqwtci kpi "r ctvlekr cpwu"vq"f tkpn'y cvgt "kp"vj g"r tg/vtkcn'r tgr ctcvqp" r gtlkf " ku" pqv" gpqwi j " vq" cej kxg" gwj { ftcvqp" dghqtg" gzgtekug" vguu0' Tgugcte j gtu" ctg" tgeqo o gpf gf " vq" ko r ngo gpv'j { ftcvqp" utcvgi kgu" cpf " vguv' uwldgewu" qp" vj gkt"cttkxcn"vq" o gcuwtg"eqo r rkepeg0'

Kp"cp"kf gcn'uegpctkq. "r ctvlekr cpwu"y kn'tgegkxg"r tg/r centi gf "o gcnu. "tgr rkecvg"vj g"vtclpkpi " uguukqp. "tgegkxg" c"j { ftcvqp" utcvgi { "cpf "cxqkf "creqj qn'cpf "echhklpg"46/j qwtu"r tlqt"vq" gxgt { "tkcn0Vj ku'y kmj cxg" c"uki phlecpv'eqpvtkdwkqp"vq"o kpkokupi "vj g'pqkug"kp"vj g'tguwu0' J qy gxgt. "pq"qpg"j cu" { gv'eqpukf gtgf "lpvxguki cvkpi "y j gvj gt"vj g"o qf g"qh"vcpur qtv"ku" c" r qvgpvcl'n' gz vcpvgquu" xctcdrg" cngtkpi " dmqqf " dkqo ctngtu0' Vj g" hpcn' uwf { . " vj gtghqtg. " gzco kpgf "vj g"ghge'v'qh"vj g"o qf g"qh"vcpur qtv"v'cnkpi "vj g'dwu. "y cmkpi . "cpf "e { erkpi +r tlqt" vq"i n{ecgo ke"lpf gz "vguvki "qp"vj g"y kj kp/uwldgev"xctcdkkr { "qh'dmqqf "i nweug"cpf "lpuwkpi" tgur qpugu0' Vj g" uwf { "eqpenwf gf "vj cv'r ctvlekr cpwu"uj qwf "cxqkf "ej cpi kpi "vj g"o qf g"qh" vcpur qtv'dgw ggp"xkuku"gur gekcm { "y cmkpi "vq"vj g"ndqtcvqt { "qp"vj g"o qtpkpi "qh"vj g'vguv'kh" cp { "qvj gt"o qf g"qh"vcpur qtv'y cu'wugf "qp"vj g"qvj gt"vguvki "f c { u0K'gcm { . "uwldgewu"uj qwf "dg" cungf "vq" wug"vj g"uco g"o qf g"qh"vcpur qtv"lp"qtf gt"vq"tgf weg"vj g"y kj kp/uwldgev"xctcdkkr { " dgw ggp"i n{ecgo ke"lpf gz "vguu0'

Vj ku"Rj F "cf f u"guugpvkn"lphqto cvkqp"v"j g"ctgc"qh"flgvct {"ucpf ctf kucvqp0 Vj g"uwf lgu" tgr qtvgf "kp"j ku"j guku"r tqxkf g"gxkf gpeg"j cv"uqo g"flgvct {"ucpf ctf kucvqp"vgej pls wgu"ecp" ngcf "v" eqpukf gtcdng" xctkcdkx {"kp" gpgti {"cpf "o cetqpwtkgpv" kpveng0 Vj g"j guku" cnuq" r tqr qugf "cp"ko r tqxgf "o gvj qf "v"eqpvqn"flgvct {"kpveng"y j lej "y cu"uj qy p"v"j cxg"o qtg" cf xcpvci gu"j cp"j g"ewttgpv"i qrf "ucpf ctf 0 Qxgtcm"j g" hkpflpi u" qdvckpgf "y km"j gr " ko r tqxg"j g"s wcrk {"qh" hwwtg"tgugctej "r tqlgeu" d {"tgf vekpi "j g"pqkug"kp"j g"tguwmu0 Cmj qwi j "j g"r tgr ctcvkqp"qh"NK lgv"cpf "ko r ngo gpvcvqp"qh"j {"f tcvkqp"utcvgi lgu"o ki j v'r w' gzvc"dwtf gp"qp"tgugctej gtu"y g"dgrkxg"j cv"j g"dpgghku"qwy gli j "j g"dwtf gpu0D {"wukpi "j g"NK lgv"tgugctej gtu"y km"qpn {"pggf "v"ur gpf "j tgg"j qwtu"kp"vqcn"v"r tgr ctg"lqqf "hqt"vgp" r ctvek cpw"cpf "equu"cr r tqzko cvgn {"C322022"r qwpf u"y j lej "lu'hgcukdng"lqt"j g"o clqt {"qh" tgugctej "uwf lgu0 Hkpcn {"tgugctej gtu"ecp"r tqxkf g"r ctvek cpw"y kj "c"722"o n'dqwg"qh" y cvgt "v"equwo g"dghqtg"eqo lpi "v"j g"mdqtcvqt {"cpf "j gp"vgu"j gk"wtkg"quo qmrk {"hqt" eqo r rkepeg"qp"j gk"cttkcn"j lej "puwtg"j cv"cmr ctvek cpw"ctg"gwj {"f tcvf 0

8.2 Strengths and limitations

K'y cu"cr r ctgpv"j cv"j g"v"r gu"qh"uwf lgu"eqpf wevgf "kp"j ku"j guku"tgs wktg"j ki j gt"ngxgn"qh" ceewtce {"kp" qtf gt"v"o gcuwtg" ceewtcvn {"j g" tgr tqf wekdck {"qh" f khtgtpv" flgvct {"ucpf ctf kucvqp"cr r tqcej gu"cpf "kpetgcug"j g"rkngkj qgf "qh"qdugt xkpi "c"r quukdng"ghge0 Vj gtghqtg."k'y cu"guugpvkn"v"tgf weg"j g"co qwpv"qh"pqkug"lqtgo "cm"o gcuwtgf "r ctco gvgtu"v" c"o kpo wo 0Hqt"j ku"tgcuqp."o cp {"o gcuwtgu"y gtg"vengp"fwtkpi "j g"r tg/vgukpi "r gtlqf 0Kp" uqo g" ecugu." r kqv" uwf lgu" y gtg" eqpf wevgf "eqpvkdwkpi "v"j g" hpcn" f guki p" qh"j g" gztgkto gpv0Gs wkr o gpv"y cu"tki qtqwn {"vgugf "cpf "o cp {"j qwtu"y gtg"ur gpv"r tcevekpi "kp" qtf gt"v"ko r tqxg"j g"fgvgvqp"qh"uki pcn"y kj "ceewtce {0Cu" c"tguw: "hqt"gzco r ng."j g" EX' "qh"j g"Cpcnqz" I O 9"qdvckpgf "chgt"kpvgpukxg"r tceveg"y cu"20' "hqt"dnqf "i mequg" cpf "204' "hqt"dnqf "reecvg"y j lej "ctg"eqpukf gtgf "lqy "ngxgn"qh"xctkcvkpu0"

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y j gtg"r ctvlekr cpwu"npgy "y cv"y j gk"eqo r nlepeg"ku"dgkpi "o qpkqatgf "Rj knkr u"gv"cr04236=" Xqr g"gv"cr0422; +0'

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8.3 Recommendations for future work

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Bibliography

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International Journal of Sport Nutrition and Exercise Metabolism."47*5+."r r 04; 56
 4; 90"

Eqo o kwgg."K0T0"42270I wkf grkpgu'hqt"fcv"r tqeguulpi "cpf "cpcn{uku'qh'yj g'lpvgtpcvkqpcn"
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Journal of the American Dietetic Association."326*6+."r r 07; 768250'

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 3; 0"

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 43*4+."r r 089268960"

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 chemistry.*"74*6+."r r 08236450"

F cxkgu."R0UY 0"gv'cn0"3; ; 90Vqvcn'gpgti {"gzr gpv kwtg"cpf "r j {"ulecn'cevxxkv{"lp"}{qwpi "
 Ej kpgug'i {"o pcuu0*Pediatric Exercise Science.*."; *5+."r r 046564740"

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43*5+.'r r 043565: 0"

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73*33+.'r r Q 676730"

F gpi rgt."LO'gv'cr0'42360F khtgpegu'kp'r clp'r gtegr vkp'f wtkpi "qr gp'o wueng'dkqr u{ "cpf "
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F gr ctvo gpv'hqt"Vtcur qtv."42350F gr ctvo gpv'hqt"Vtcur qtv/"J qy 'r gqr ng'vtcxgn'o qf g+ "
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F qj gtvl."O 0("Uo kj ."RO0 0'42270Ghgevu'qh'echhgkpg'kpi guvkp'qp'tcvkpi "qh'r gtegxgf "
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medicine & science in sports.*"37*4+.'r r 08; 69: 0'

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metabolism.*"45*8+.'r r 07766830'

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Medicine and science in sports and exercise."47*34+.'r r 085; : 66260'

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323*4+.'r r 08946; 30"

Gtlemqp."O 0C0'Uej y ct| nqr h."TLO("O eMgp| kg."T0F 0'3; : 90Ghgevu'qh'echhgkpg."
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Medicine and science in sports and exercise."3; *8+.'r r 079; 6: 50"

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metabolism.*"37*3+.'r r 086360"

Guxqp."T0 0'Tqy rcpf u."C0X0("kpi rfg gy ."F 0M0'3; ; : 0Xcrkf kv{ "qh'j gctv'tcvg.'r gf qo gt{."
cpf "ceegrtqo gt{ "hqt'r tgf kvkpi "yj g"gpgti { "equv'qh'ej kftgpau'cevxxkkgu0*J Appl
Physiol.*": 6*3+.'r r 08465930"

Xcp'Gwgp."NO0 (NO0'gv'cr0'3; ; 90Ghgevu'qh'cp'3: /y mly gli j v'vckp'kpi "rtqi tco "qp'gpgti { "
gxr gpf kwtg'cpf 'r j {ulecn'cevxxk{0*J Appl Physiol.*": 4*3+.'r r 04; : 65260"

Hkuej dcej ."H0'42260*A Manual of Laboratory and Diagnostic Tests*"9yj "gf kkkp."

Rj kxf gr j k'Re0'

Hqi grj qm . 'E0gv'cr0'42290Tgukpi 'O gvdqre'Tev'cpf 'Gpgti { 'kvcng'kp'Hgo cng"
I { o pcuu.'Hli wtg/Uncvgtu'cpf 'Uqegt'Rrc {gtu0International Journal of Sports
Medicine."38*2: +.'r r 07367780"

Hqqf "cpf 'Ci tlewnwtg'Qti cplk cvkqp'Y qtrf 'J gcnj 'Qti cplk cvkqp'JHCQ'Y J Q_."3; ; : 0'
Carbohydrates in human nutrition. Report of a joint FAO/WHO expert consultation."
Tqo g0'

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r r 063680"

I cplq.'O 00'gv'cr0'422; 0Ghgeu'qh'echgkpg'qp'ur qt v ur gekke"gpf wtcepg'r gthqto cpeg'<c"
u{uvgc vke'tgxky 0Journal of strength and conditioning research."45*3+.'r r 05376460"

I gtuqxk{ . 'O0'O c f f gp.'L0R0('Uo lekmcu/Y tki j v.'J 0'3; 9: 0Xcnk k{ 'qh'y g'46/j t0f kvct { "
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Association."95*3+.'r r 06: 6770"

I qrf dgti . 'I 0T0'Drcem'C0G0'gv'cr0'3; ; 30Etkecn'gxcnvcvqp'qh'gpgti { 'kvcng'f cvc'wukpi "
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kf gpwh{ 'wpgt/tgeqtf kpi 0European journal of clinical nutrition."67*34+.'r r 078; 6: 30"

I qrf dgti . 'I 0T0'gv'cr0'3; ; 50Nqpi kwf kpcn'cuuguu gpv'qh'gpgti { 'gzr gpf kwg'kp'r tgi pcpe { "
d { 'y g'f qwdn{ 'rcdgrf 'y cvgt'o gj qf 0The American journal of clinical nutrition."
79*6+.'r r 06; 667270"

I qrf dgti . 'I 0T0'Rtgpveg.'C000'gv'cr0'3; ; 30Nqpi kwf kpcn'cuuguu gpv'qh'y g'eqo r qpgrwu"
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clinical nutrition."76*7+.'r r 09: : 6; : 0'

I qmplem'R0F0'Rkij n'M0('Ucnkp.'D0'3; 960Ugrgevkxg'i n'eqi gp'f gr ngvqp'r cwgt'p"
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tcvu0The Journal of Physiology."463*3+.'r r 0676790"

I qo gl /Ecdtgtc.'O0E0'gv'cr0'422: 0Qtcn'cf o kplm'cvkqp'qh'xkco kp'E'f getgcugu'o wuerg"
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r gthqto cpeg0The American journal of clinical nutrition.".: 9*3+.'r r 0646; 0"

I qpl 'a rgl /Cnpuq.'L0'gv'cr0'3; ; 70F gj { ftcvqp'tgf wegu'ectf kce'qwr w'cpf 'kpetgcugu"
u{uvgc le'cpf 'ewcpgqu'xcuewrt'tgukv'cepg'f wt kpi 'gz gtekug0Journal of applied
physiology ."9; *7+.'r r 06: 96; 80"

- I qpl^a rg| /Cmpuq. 'L0'Ecnlgv. 'L0C0('P lgnugp. 'D0'3; ; : 00 wueng'dmqqf 'hny 'ku'tgf wegf 'y kj " f gj { f tcvkqp'f wtkpi 'r tqmpf gf "gzgtekug'kp"j wo cpu0*The Journal of physiology.*" 735*5+.'r r 0 ; 76; 270'
- I qpl^a rg| /Cmpuq. 'L0'O qtc/Tqf t^ql wgl. 'T0('Eq{rg. 'GHD'42220Utgng'xqno g'f wtkpi " gzgtekug<lpvgtcevkqp'qh'gpxktqpo gpv'cpf 'j { f tcvkqp0*American journal of physiology. Heart and circulatory physiology.*49: *4+.'r r 0 5436520'
- I qtktu. 'C0 0('Y guvgtvgr. 'M0'3; ; : 0Wpf gttgr qt vki 'qh'j cdkwcnhqqf 'lpvcng'ku" gzn rckpgf 'd{ 'wpgtgcvkpi 'kp"j ki j n{ 'o qkxcvgf 'rgcp'y qo gp0*The Journal of nutrition.*" 34; *6+.'r r 0 9: 6: 40'
- I tcj co. 'V0G0'42230Echhkgp'cpf "gzgtekug<o gvcdrkuo. "gpf wtcepg'cpf 'r gthqto cpeg0*Sports medicine.*"53*33+.'r r 0 76: 290'
- I tcj co. 'V0G0'gv'cr0'42220Echhkgp'kp'gukqp'f qgu'pqv'cngt'ectdqj { f tcv'qt'hc'v" o gvcdrkuo 'kp"j wo cp'ungwcn'o wueng'f wtkpi "gzgtekug0*The Journal of physiology.*" 74; 'Rv'5.'r r 0 596690"
- I tcj co. 'V0G0'gv'cr0'422: 0F qgu'echhkgp'cngt'o wueng'ectdqj { f tcv'cpf 'hc'v'o gvcdrkuo " f wtkpi "gzgtekug0*Applied physiology, nutrition, and metabolism.*"55*8+.'r r 0 5336: 0"
- J cpugp. 'V0M0'gv'cr0'42240Y gli j v'huu'lpetgcugu'ektewr vki 'rgxgu'qh'i j tgrk'kp"j wo cp" qdguv{ 0*Clinical Endocrinology.*"78*4+.'r r 0 42564280"
- J cti tgcxgu. 'O 0'gv'cr0'3; ; 80Ghgev'qh'hmkf 'kp'gukqp'qp'o wueng'o gvcdrkuo 'f wtkpi " r tqmpf gf "gzgtekug0*Journal of applied physiology.*"2*3+.'r r 0 585680"
- J cttku. 'L0C0('Dgpgf kev. 'H0 0'3; 3: 0C'Dkqo gtle'Uwf { 'qh'J wo cp'Dcucn'O gvcdrkuo 0' *Proceedings of the National Academy of Sciences of the United States of America.*" 6*34+.'r r 0 592650"
- J cttku. 'T0E0'U³4 gtnmpf. 'M0('J wno cp. 'G0'3; ; 40Gngxcvkqp'qh'etgcvkpg'kp'tgukpi 'cpf " gzgtekugf 'o wueng'qh'pqto cn'uwldgeu'd{ 'etgcvkpg'uw r ngo gpvcvkqp0*Clinical science.*" : 5*5+.'r r 0 5896960"
- J cy rg{. 'L0'gv'cr0'3; ; 90Ectdqj { f tcvg/mcf lpi 'cpf "gzgtekug'r gthqto cpeg0Cp'wr f cvg0*Sports medicine.*"46*4+.'r r 0 56: 30'
- J cy rg{. 'L0C0'Rcm gt. 'I 00('P qcng. 'V0'3; ; 90Ghgevu'qh'5'f c{ 'u'qh'ectdqj { f tcvg" uw r ngo gpvcvkqp'qp'o wueng'i n'eqi gp'eqpvgpv'cpf "wkrucvkqp'f wtkpi 'c'3/j 'e{erkpi " r gthqto cpeg0*European journal of applied physiology and occupational physiology.*" 97*7+.'r r 0 6296340"
- J c{cu j k' l 0'gv'cr0'42270C'ukpi ng'dqw'qh'gzgtekug'cv'j ki j gt 'lpvgpukv{ 'gpj cpegu'i nweug" ghgevkxgpgui'kp'ugf gpvct{ 'o gp0*Journal of Clinical Endocrinology and Metabolism.*" ; 2*9+.'r r 0 6257662620'
- J glmupgp. 'G0'gv'cr0'3; ; : 0Ghgev'qh'creqj qn'qp'gzgtekug/kpf wegf 'ej cpi gu'kp'ugt wo " i nweug'cpf 'ugt wo 'tgg'hcw{ 'cekf u0*Alcoholism, clinical and experimental research.*" 44*4+.'r r 0 596650"
- J gko cpp. 'DN0'3; ; 50Vj g'lpnwpeg'qh'hcvguu'y gli j vej cpi g. 'urko o kpi 'j kuxqt{ 'cpf " qy gt'rhguv'ng'xctkdngu'qp'f kv'tgr qt vki 'kp'F cpkuj 'o gp'cpf 'y qo gp'ci gf '57/87"

- {gctu0International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity."39*8+."r r 64; 6580"
- J gto cpugp."N0"J wno cp."G0("Ucnkp."D0"3; 890O wuerg'i n{eqi gp'f wtkpi 'r tqmipi gf 'ugxgtg" gzgteku0Acta physiologica Scandinavica."93*4+."r r 64; 65; 0"
- J gv rgt."T0M0gv'cr0"3; ; 60Ghgeu'qh'cewg"echhkgp'y kj f tcy cn'qp"j cdkwcvgf "o crg" twppgtu0Journal of applied physiology."98*5+."r r 62656; 0"
- J km"TL0("F cxkgu."R0U0"42230Vj g'xcnkf k{ "qh'ugrh'tgr qtvgf "gpgti { "lpvcng"cu'f gvgto kpgf " wulpi "j g'f qwdn{ 'hcdgmrf "y cvgt "gej pls wg0The British journal of nutrition."; 7*6+." r r 6376520"
- J km"TL0("F cxkgu."R0U0Y 0"42240Gpgti { "lpvcng"cpf "gpgti { "gzs gpf kwtg'lp"grkg" rki j vy gki j v'ho crg'tqy gtu0Medicine and science in sports and exercise."56*33+." r r 6: 456; 0"
- J qr mgt."LI 0gv'cr0"42340Tgrkcdk{ "qh'E {enki "I tqui"Chhkgpe { "Wulpi "j g'F qwi mcu'Dci " O gij qf 0Medicine & Science in Sports & Exercise."66*4+."r r 64; 264; 80"
- J qr nkpu."Y 0 0"42220O gcuwtgu'qh'tgrkcdk{ "lp"ur qtui'o gf lekpg"cpf "uelgpeg0Sports medicine."52*3+."r r 66370"
- J qr nkpu."Y 0 0"J cy rg{ ."L0c"("Dwtng."N00 0"3; ; ; 0F guki p"cpf "cpcn{ ulu'qh'tgugctej "qp" ur qtvr'gthqto cpeg"gpj cpego gp0Medicine and science in sports and exercise."53*5+." r r 6946; 70"
- J qr nkpu."Y 0 0"Uej cdqtv."G0L0("J cy rg{ ."L0C0"42230Tgrkcdk{ "qh'r qy gt'lp'r j { ulecn" r gthqto cpeg'vguu0Sports medicine."53*5+."r r 64336560"
- J qtxcvj ."R0L0gv'cr0"42220Vj g'ghgeu'qh'xct { lpi "f lgvct { "hcv'qp'r gthqto cpeg"cpf " o gxcdqrkuo "lp"vtckpgf "o crg"cpf "hgo crg"twppgtu0Journal of the American College of Nutrition."3; *3+."r r 6746820"
- J qy cv."R00 0gv'cr0"3; ; 60Xcnkf k{ "cpf "tgrkcdk{ "qh'tgr qtvgf "f lgvct { "lpvcng"fcvc0Journal of the American Dietetic Association."; 6*4+."r r 68; 63950"
- J qy g."U0V0gv'cr0"42350Vj g'ghgeu'qh'dgvc/crckp{ "uwr r rgo gpvcvqp"qp"luqnkp{ "hqtg" cpf "e {enki "r gthqto cpeg"lp"j ki j n{ "vtckpgf "e {enku0International journal of sport nutrition and exercise metabolism."45*8+."r r 67846920"
- J qy rg{ ."G0V0"Dcuugw."F 0T0("Y grej ."J 0 0"3; ; 70Etkgtk"ht'o czko cn'qz { i gp'wr vcng< "tgxkgy "cpf "eqo o gpvt { 0Medicine and science in sports and exercise."49*; +." r r 64; 465230"
- J wpgt."C00 0gv'cr0"42240Echhkgp"lpi gukqp"fqgu'pqv'cngt'r gthqto cpeg"fwtkpi "c"322/no " e {enki "ko g/vtkn'r gthqto cpeg0International journal of sport nutrition and exercise metabolism."34*6+."r r 65: 6740"
- Kpukwwg"qh'O gf lekpg."42270Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate."Y cuj lpi vqp."F 0E0P cvkqpcn'Cecf go lgu'Rtgu0"
- Kpytgcvkqpcn"Ucpf ctf u"Qhheg."42320ISO 26642:2010 Food products - Determination of the glycaemic index (GI) and recommendation for food classification."I gpgxc0"

Kcs."42240International Physical Activity Questionnaires Ipaq : Short Last 7 Days Self-Administered Format."

K{."1N0gv'crl0"3; 9; 0Kphwpeg"qh'echhgkpg"cpf"ectdqj {f tcvg'hggf kpi u'qp"gpf wtcepg"r gthqto cpeg0Medicine and science in sports."33*3+."r r 086330"

Ks wktf q."O 0'gv'crl0"42240Ghgewu'qh'etgcwkp"uwr r go gpvcwkp"qp"o wueng"r qy gt."gpf wtcepg."cpf"ur tlpv'r gthqto cpeg0Medicine and science in sports and exercise."56*4+."r r 0546650"

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Lgpnkpu."P 0V0gv'crl0"422: 0Gti qi gple"ghgewu'qh'rqy "f qugu'qh'echhgkpg"qp"e {enkpi "r gthqto cpeg0International journal of sport nutrition and exercise metabolism."3: *5+."r r 054: 6640"

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Lqj puqp."P 0C0gv'crl0"42280Ghgewu'qh'cngt gf "r tg/gz gtekug"ectdqj {f tcvg"cxckrdkklv { "qp"ugrgevwkp"cpf"r gtegr wkp"qh'ghqtvf wt kpi "r tqmipi gf "e {enkpi 0European journal of applied physiology."; : *3+."r r 0846920"

Lqj puqp."T 0M0"Uqwnpcnku."T 0R0'("O cwj gy u."F 0G0"3; ; : 0Nkgtce { "cpf"dqf { "hcvpguu'ctg"cuuqekcvgf "y kj "wpg gttgr qt kpi "qh'gpgti { "kpcng"kp"WU'rqy /kpeqo g'y qo gp"wkpi "y g"o wnk r g/r cuu'46/j qwt "tgecm'c" f qwdn { "rdgrgf "y cvgt"uwf { 0Journal of the American Dietetic Association."; : *32+."r r 03586620"

Lqpgu."R0L0'("Ngkej ."E0C0"3; ; 50Xcrkf cvkqp"qh'f qwdn { "rdgrgf "y cvgt"ht"o gcuwt go gpv'qh'ecmtle"gzr gpf kwt g"kp"eqmgi kvg"uy ko o gtu0Journal of applied physiology."96*8+."r r 04; 2; 6360"

f g'Lqpi g."N0gv'crl0"42290Xcrkf cvkqp"uwf { "qh'gpgti { "gzr gpf kwt g"cpf "kpcng" f wt kpi "ecmtlg"tgutlevkp"wukpi "f qwdn { "rdgrgf "y cvgt"cpf "ej cpi gu"kp"dqf { "eqo r qukkqp0The American journal of clinical nutrition."; : 7*3+."r r 056; 0"

Lqthgrf v."N0'("Lwj kp/F cpphgn."C0"3; 9: 0Vj g"kpwhwpeg"qh'gvy cpqn'qp"ur rpej ple"cpf "ungrgv'crl0 wueng"o gvcdrkuo "kp"o cp0Metabolism: clinical and experimental."49*3+."r r 0 963280"

Mctnuqp."L0'("Ucnkp."D0"3; 930F kgv."o wueng"i n {eqi gp."cpf"gpf wtcepg"r gthqto cpeg0J Appl Physiol."53*4+."r r 042564280"

Mgpftlem"\ 0X."Chtko g."O 0D0'("Nqy gpj cn."F 0V0"3; ; 50Ghgewu'qh'gvy cpqn'qp"o gvcdrke"tgur qpugu"q"tgcf o km'twplkpi "kp"y gm'wckpgf "o gp0Journal of clinical pharmacology."55*4+."r r 0586; 0"

Mgpghlem."T 0Y 0'gv'crl0"42320Unkp"vgo r gtcwtg"o qf khgu'y g"lo r cev'qh'j { r qj {f tcvkqp"qp"cgtdle"r gthqto cpeg0Journal of applied physiology."32; *3+."r r 09; 6: 80"

Mkpi ."F 0U0gv'crl0"3; ; 70Vko g"eqwtug"ht"gz gtekug/kp weg f "cngtcwkp"u'kp"kpukp"cevkqp"cpf "

- i nweug"vqrgtcpeg"kp"o kf f ng/ci gf 'r gqr ng*J Appl Physiol.*'9: *3+.'r r 896440"
- Mkpi . 'P 00'gv'cr0"422: 0Kpf kxf wcn'xctkcdkxv' hqmy kpi '34'y ggmu'qh'uwr gtxkugf "gz gtekug"< kf gpv'khec'vqp"cpf "ej ctcevgtk' c'vqp"qh'eqo r gpuc'vqp"ht"gz gtekug/kpf wegf 'y gli j v'hquu0*International journal of obesity (2005).*"54*3+.'r r 8996: 60"
- Mpwf ugp. 'U0'0gv'cr0"42360Vj g'ko o gf kcv'g'ghgeu'qh'c'ukpi ng'dqw'qh'cgtqdkle"gz gtekug"qp" qtcn'i nweug"vqrgtcpeg"cetquu'vj g'i nweug"vqrgtcpeg"eqp'vkwwo 0*Physiological Reports.*"4*: +.'r r 8343366g343360"
- Mt'gkf gt. 'T0D0"42250Ghgeu'qh'etgc'vqp'uwr r ngo gpvc'vqp"qp'r gthqto cpeg"cpf "tcl'kpki " cf cr v'vqp'u0*Molecular and cellular biochemistry.*"466*3/4+.'r r 0; 60"
- Mt'gkf gt. 'T0D0'gv'cr0"42320KUP "gz gtekug"("ur qtv'pwt'k'kqp't'gx'kgy <t'gugctej "(" tgeqo o gpf c'vqp'u0*Journal of the International Society of Sports Nutrition.*"9*3+.'r r 90"
- Mt'gw'ej . 'O 00'Hqpi . 'C0M0('I tggp. 'O 0Y 0'3; ; ; 0Dgj cxkqtcn'cpf "dqf { "uk' g'eqttgr'v'gu'qh" gpgti { "lpvcng"wpf gttgr qt'v'pi "d{ "qdgug"cpf "pqto cn'y gli j v'y qo gp0*Journal of the American Dietetic Association.*."; *5+.'r r 82268=s w'k' "5296: 0"
- Nchc { . 'N0'gv'cr0"3; ; 90F gvgto kpcpu'cpf "pcwtg'qh'f'kgvct { "wpf gttgr qt'v'pi "lp'c'htgg'rkx'kpi " r qr w'v'vqp"<'vj g'Hgwt'dclz "Ncxgp'v'kg'Xkng'Ucp'v' *HNXU+Uwf { 0*International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity.*"43*9+.'r r 87896950"
- Nco dgtv. 'G0X"gv'cr0"3; ; 60Gpj cpegf "gpf wtcpeg"lp"tcl'kpgf "e { erkuu'f wt'kpi "o qf gtcvg" kpvgpuk' { "gz gtekug'hqmy kpi "4'y ggmu'cf cr v'vqp"v'q'c'j ki j 'hcv'f kgv0*European journal of applied physiology and occupational physiology.*"8; *6+.'r r 04: 96; 50"
- Ncwt'gpv. 'F0'gv'cr0"42220Ghgeu'qh'ech'g'kpg"qp"o wueng'i n'eqi gp'w'k'k'k' c'vqp"cpf "vj g" pgwt'qgpf qet'kpg'cz'ku'f wt'kpi "gz gtekug0*The Journal of clinical endocrinology and metabolism.*.". 7*8+.'r r 04392670"
- Ngeq'wntg. 'X0('Uej w' . 'I 0"422; 0Ghgeu'qh'c'uo cm'f qug'qh'creqj qn'qp"vj g"gpf wtcpeg" r gthqto cpeg"qh'tcl'kpgf "e { erkuu0*Alcohol and alcoholism.*"66*5+.'r r 049: 6; 50"
- Ngp| . 'G00'0gv'cr0"42250C'3J 'P O T/dcugf "o gwcdqppqo le"uwf { "qh'wt'kpg"cpf "r ncuo c" uco r ngu'qdv'kpgf "ht'qo "j gcnj { "j wo cp'uwdlgeu0*Journal of Pharmaceutical and Biomedical Analysis.*"55*7+.'r r 8325633370"
- Nkf f ng. 'F0 0('Eqppqt. 'F 00"42350P wtk'k'qpcn'Uwr r ngo gpw'cpf "Gti qi gp'ke'C'kf u0' *Primary Care: Clinics in Office Practice.*"62*4+.'r r 06: 967270"
- Nkpf j . 'C00'0gv'cr0"422: 0Uqf kwo "dlectd'qpcvg'ko r tqxgu'uy ko o kpi "r gthqto cpeg0' *International journal of sports medicine.*"4; *8+.'r r 073; 6450"
- Nkx'kpi uvqpg. 'O 0D0'gv'cr0"3; ; 20Cee'w'ce { "qh'y gli j gf "f'kgvct { "tgeqtf u'lp'uwf kgu'qh'f'kgv'cpf " j gcnj 0*BMJ (Clinical research ed.).*"522*8948+.'r r 02: 6340"
- Nwpf s wkuv. 'H0'gv'cr0"3; 870I n'egtqn'o gwcdq'kuo "lp"vj g'j wo cp'ikxgt'<lpj kdk'kqp"d { "gy cpqr0' *Science.*"372*58; 8+.'r r 838690"
- N { pej . 'U0"42350Vj g'f'k'ht'gp'v'cn'ghgeu'qh'c'eqo r ngz "r tqv'k'p'f' t'k'pn'ixgt'uwu'luqec'm'q'le" ectdqj { f'tcvg'f' t'k'pn'qp"r gthqto cpeg"lp'f'legu'hqmy kpi "j ki j /kpvgpuk' { "t'guk'v'cpeg"

vtclpłpi <“y q”cto “etquuxgt”f guki p0*Journal of the International Society of Sports Nutrition*.“32*3+.”r 0530

O cef gto kf .“ROY 0gv”cr0“42340C”eqo r ctcvkxg”cpnc{uku’dgvy ggp”yj g”ghgeu”qh”i crcevqug”
cpf ”i nvequg”uwr r ngo gpvcvkqp”qp”gpf wtcepg”r gthqto cpeg0*International journal of
sport nutrition and exercise metabolism*.“44*3+.”r 0466520”

O cem”I 0Y 0gv”cr0”3; ; 60Dqf {”hmkf”dcrpep”lp”f gj {f tcvgf”j gcnj {”qrf gt”o gp<”yj ktuv”cpf ”
tgpnc’quo qtgi wrcvkqp0*Journal of applied physiology*,’98*6+.”r 08376450”

O cf ugp.”M0gv”cr0”3; ; 20Ectdqj {f tcvg”uwr gteqo r gpucvkqp”cpf ”o wueng”i n{eqi gp”
wklkucvkqp”f wtłpi ”gzj cwvkxg”twppłpi ”lp”j ki j n{”vtclpłgf ”cy ngvu0*European journal of
applied physiology*.’83.”r 068966940

O cf ugp.”M0gv”cr0”3; ; 20Ectdqj {f tcvg”uwr gteqo r gpucvkqp”cpf ”o wueng”i n{eqi gp”
wklk cvkqp”f wtłpi ”gzj cwvkxg”twppłpi ”lp”j ki j n{”vtclpłgf ”cy ngvu0*European journal of
applied physiology and occupational physiology*.’83*7/8+.”r 06896940

O â j nwo .”U0(”J gto cpugp.”N0”3; 9: 00 wueng”i n{eqi gp”eqpegpvtclpłgf ”f wtłpi ”tgeqxt {”
chgt”r tqmłpi gf ”ugxgtg”gz gtekug”lp”hcvłpi ”uwdlgeu0*Scandinavian Journal of Clinical
and Laboratory Investigation*.”5: *8+.”r 07967820”

O ci c| cpłm”C0gv”cr0”3; ; 30Ghgev”qh”cp”ktqp”uwr r ngo gpv”qp”dqf {”ktqp”ucwu”cpf ”cgtqdle”
ecrcek{”qh”{qwpł ”vtclpłpi ”y qo gp0*European journal of applied physiology and
occupational physiology*.’84*7+.”r 05396450”

O ci nqu.”H0(”I cppenqwk.”O 0”42250O gyj qf qmłi {”qh”f kgvct {”cuuguuo gpv”lp”cy ngvu<”
eqpegr vu”cpf ”r kłcm0*Current opinion in clinical nutrition and metabolic care*.’8*7+.”
r r 075; 66; 0”

O ctłp”Drcpf.”L0(”Cno cp.”F 0”3; : 80Ucwkłecr0”o gyj qf u”hqt”cuugułpi ”ci tggo gpv”
dgvy ggp”y q”o gyj qf u”qh”enłpłecr0”o gcuwtgo gpv0*The Lancet*.’549*: 698+.”r 052965320”

O cwi j cp.”T0L0”42250K r cev”qh”o kłf ”f gj {f tcvkqp”qp”y gmpguu”cpf ”qp”gz gtekug”
r gthqto cpeg0*European journal of clinical nutrition*.’79”Uwr r n4.”r 003; 6450

O eEnłpi .”L0R0gv”cr0”422; 0Tcpf qo kł gf .”f qwdrg/dłłpf .”r rcegdq/eqpvtqmłf ”vtcln”qh”ktqp”
uwr r ngo gpvcvkqp”lp”hgo crg”uqrf kgtu”f wtłpi ”o kłxct {”vtclpłpi <”ghgeu”qp”ktqp”ucwu.”
r j {ukcłnr gthqto cpeg.”cpf ”o qqf 0*American Journal of Clinical Nutrition*.”2*3+.”
r r 084663530”

O eNclp.”V0C0gv”cr0”42370F gxgnr o gpv”qh”cp”Cpcgtqdle”Ur tłpv”Twppłpi ”Vguv”Włłpi ”c”
P qpo qvqtł gf ”Vtgcf o kł0*Journal of strength and conditioning research / National
Strength & Conditioning Association*.”4; *: +.”r 043; 964260”

O eP cwi j vqp.”N0(”Rtggeg.”F 0”3; : 80Creqj qn”cpf ”ku”ghgeu”qp”ur tłpv”cpf ”o kł f rg”f kwcpeg”
twppłpi 0*British journal of sports medicine*.’42*4+.”r 0786; 0”

O gtt {.”V0N0”Cłpłng.”R0P 0(”Eqwgt.”L0F 0”42320Ghgeu”qh”cgtqdle”hłpguu”qp”
j {r qj {f tcvkqp/kpf wegf ”r j {ukqmłi kcln”vtclp”cpf ”gz gtekug”lo r ckt o gpv0*Acta
physiologica*.”3; : *4+.”r 089; 6; 20”

O gtł .”Y 0”3; ; 40Hqqf ”łpvcng”o gcuwtgo gpv<”ku”j gtg”c”oi qrf ”ucpf ctf öA”*Journal of the
American Dietetic Association*.”4*34+.”r 0685670”

- O gtv. 'Y 0'gv'cr0'3; ; 30Y j cv'ctg'r gqr ng'tgcm{ 'gc'vpi A'Vj g'tgrv'vqp'dgy ggp'gpgti { 'k'pvcng' f gtxgf 'htqo 'guko cvgf 'f kgv'tgeqtf u'cpf 'k'pvcng'f gvgto kpgf 'vq'o c'pvc'p'dqf { 'y gki j v0' *The American journal of clinical nutrition.*'76*4+.'r r 04; 3670"
- O gwt. 'U0('\ ko o gto cpp.'O 00'42320Kqp'gzeguu'k'p'tgetgc'v'k'p'cn'o ctc'v' qp'twppgtu0' *European Journal of Clinical Nutrition.*'86*7+.'r r 06; 266; 60"
- O k'k'p. 'O 0'gv'cr0'3; ; 20C'pgy 'r tgf k'v'x'g'gs w'v'v'p'hqt't'g'v'k'p' "gpgti { 'g'zr gpf kwt'g'k'p' j gcnj { 'k'pf k'kf w'cn0Am J Clin Nutr.'73*4+.'r r 046364690"
- O k'p'g. 'C0E0'O eP gkm'I 0('\ c'nt {.'C0'3; ; 30Y gki j v'ej cpi g'cu'cp'k'pf k'ecv'qt'qh'gpgti { " ko d'c'p'eg'f'v'k'p' '9'f'c { 'y gki j gf 'h'q'f 'k'pvcng'u'w'f k'gu0*Ecology of Food and Nutrition.*" 48*6+.'r r 04: 364; ; 0"
- O q'p'ec'f'c/lko gpgl. 'I0'gv'cr0'422; 0F w'v'j n'p'r gth'qto c'p'eg'w'p'cng't'gf "d { 'u'j q't'v'gto 'ej cpi gu' k'p'f'k'v'ct { 'h'v'c'p'f'ect'dqj { f't'c'v'gu0*International journal of sport nutrition and exercise metabolism.*'3; *3+.'r r 0696820"
- O q'p'v'k'p. 'U0'gv'cr0'42290Vj gto c'n'c'p'f 'E'ct'f'k'q'x'c'ue'w'ct 'U'ct'k'p'htqo 'J { r'qj { f't'c'v'k'p'< " k'p'h'w'g'p'eg'q'h'G'z'g't'ek'ug'k'p'v'g'p'uk' { 0*International Journal of Sports Medicine.*'3; *24+." r r 0 96; 30"
- O q'p'v'k'p. 'U00('E'q { r'g. 'G0H0'3; ; 40k'p'h'w'g'p'eg'q'h'i t'c'f'g'f 'f'g'j { f't'c'v'k'p'q'p'j { r'g't'v'j gto k'c'c'p'f " e'ct'f'k'q'x'c'ue'w'ct 'f't'k'm'f'v'k'p' 'g'z'g't'ek'ug0*Journal of applied physiology.*'95*6+.'r r 05626 720"
- O q's'w'k'p. 'C0('O c | | gq. 'T00'42220G'h'g'ev'q'h'o k'f 'f'g'j { f't'c'v'k'p'q'p'j'g'g'x'c'v'g'v'j t'g'uj q'rf 'k'p' y qo g'p0*Medicine and science in sports and exercise.*'54*4+.'r r 05; 866240"
- O q'uj h'gi j. 'C00'gv'cr0'422; 0Vj g'WU'F g'r'c't'v'o g'p'v'q'h'C'i t'k'ew'w'g'g'C'w'q'o c'v'g'f 'O w'v'k'r'g'R'cuu' O g'v'j q'f 't'g'f w'eg'u'd'k'u'k'p'j'g'g'eq'm'g'v'k'p'q'h'gpgti { 'k'p'vcng'u0*AMERICAN JOURNAL OF CLINICAL NUTRITION.*" : *4+.'r r 054665540"
- O q'v'iTY. 'Q'æ'q'p'p'q't'RL 'V'w'd'c'p'f'v'N.'R'w'g'v 'V.'G00 0'42280G'h'g'ev'q'h'E'ch'g'k'p'g'q'p'N'gi " O w'v'g'g'R'c'k'p'f'v'k'p' 'E { e'k'p'i 'G'z'g't'ek'ug'co q'p'i 'H'g'o c'rg'u0*Medicine & Science in Sports & Exercise.*'5: *5+.'r r 07; : 68260"
- O w'q'k'q. 'F 00'gv'cr0'3; ; 60G'h'g'ev'q'h'f'k'v'ct { 'h'v'q'p'o g'v'c'd'q'n'k'c'f'l'w'v'o g'p'u'v'q'o c'z'k'o c'n'X'Q4" c'p'f 'g'p'f'w'c'p'eg'k'p't'w'p'p'gtu0*Medicine and science in sports and exercise.*'48*3+." r r 0 36: : 0"
- P c'f'g'n'G0T0'3; ; 20E'k'ew'v'v'q't { 'c'p'f' 'v'j gto c'n't'g'i w'v'v'k'p'u'f'v'k'p' 'g'z'g't'ek'ug0*Federation proceedings.*'5; *7+.'r r 06; 3690"
- P c'v'k'p'p'cn'T'g'ug'c't'ej 'G'v'j k'eu'U'g't'x'leg.'422; 0*Issues, guidance & evidence - Deception in medical research.*"
- P c| c't. 'M0'gv'cr0'3; ; 90R'c'uo c'k'p'u'w'k'p'c'p'f 'E/r g'r'v'k'f'g't'g'ur q'p'ug'u'v'q'q't'c'n'i n'æ'q'ug'iq'c'f 'c'h'v'g't' r j { u'k'c'n'g'z'g't'ek'ug'k'p'o g'p'y k'j 'p'q'to c'n'c'p'f 'k'o r'c'k't'g'f 'i n'æ'q'ug'v'q'ng't'c'p'eg0*Acta physiologica Polonica.*'5: *8+.'r r 067: 6880"
- P g'nu'q'p. 'O 0'gv'cr0'3; ; ; 0D'g'y ggp/'c'p'f 'y k'j k'p/u'w'd'l'g'ev'x'c't'k'v'k'p'k'p'p'w't'k'g'p'v'k'p'vcng'htqo " k'p'h'c'p'e { 'v'q'q'rf 'c'i g'<G'uko c'v'k'p' 'v'j g'p'w'o d'g't'q'h'f'c { u't'g's'v'k't'g'f 'v'q't'c'p'n'f'k'v'ct { 'k'p'vcng'u' y k'j 'f'g'uk't'g'f 'r't'g'ek'uk'q'p0*American Journal of Clinical Nutrition.*'72*3+.'r r 07763890"

P gwhgt. 'R0f0gv'cr0'3; : 90K r tqxgo gpw'lp'gzgtekug'r gthqto cpeg<ghgweu'qh'ectdqj { ftcvg' hggf lpi u'cpf 'f lgv0*Journal of applied physiology.*'84*5+.'r r Q : 56: 0"

P knuqp. 'N0 0('J wno cp.'G0'3; 950Nkxgt 'i n{eqi gp'lp'o cp//vj g'ghgeu'qh'vqcn'uctxcv'kqp" qt"e"ectdqj { ftcvg/r qqt'f lgv'hqmny gf "d{ "ectdqj { ftcvg'tghggf lpi 0*Scandinavian journal of clinical and laboratory investigation.*"54*6+.'r r 0476520"

P {dq. 'N0gv'cr0'42230Ghgeu'qh'o ctngf 'j {r gtvj gto k'y kj "cpf 'y kj qwf'f gj { ftcv'kqp"qp" XQ*4+"nkp'g'leu'f wtkpi 'lpvgpug'gzgtekug0*Journal of applied physiology.*."; 2*5+" r r 02796860"

QdDtlgp. 'E0R0'3; ; 50Creqj qn'cpf 'ur qt v0K r cev'qh'uqekcn'f tlpn'kpi "qp'tgetgc'kqpcn'cpf " eqo r g'k'k'g'ur qt w'r gthqto cpeg0*Sports medicine.*"37*4+.'r r 03690"

QdDtlgp. 'E0R0('N{ qpu. 'H0'42220Creqj qn'cpf 'vj g'cvj r'vg0*Sports medicine.*"4; *7+" r r 04; 765220"

QdMgghg. 'M0C0gv'cr0'3; : ; 0F lgvct { 'ectdqj { ftcvg'lp'wcn'g'cpf "gpf wt cpeg'gzgtekug" r gthqto cpeg'qh'v'ckp'gf 'hgo crg'e{ enkuu0*Nutrition Research.*."; *+.'r r 03; 6: 520"

Qh'leg'hqt 'P cv'kqpcn'Ucv'ku'leu. '422: 0*General Lifestyle Survey-Smoking and Drinking Among Adults, 2008.*"Nqpf qp0"

Qr'kxgt. 'U00gv'cr0'422: 0Ucn'xc'lpf legu'tceni'j {r qj { ftcv'kqp'f wtkpi '6: j "qh'h'w'kf 't'gut'lev'kqp" qt"eqo d'k'p'gf 'h'w'kf "cpf "gp'gti { 't'gut'lev'kqp0*Archives of oral biology.*"75*32+.'r r Q 976 : 20"

Qr'r'ki gt. 'T0C0gv'cr0'42270Ceewtce { 'qh'v'w'k'p'g'ur gek'le'i t'cx'k'v' { 'cpf "quo q'm'k'v' { 'cu' k'p'f'lec'v'qtu'qh'j { ftcv'kqp'uc'w'u0*International journal of sport nutrition and exercise metabolism.*"37*5+.'r r 04586730"

Qu'qlle. 'U00 0('Cj o g'v'x'le. \ 0'422: 0Y ggm' { 'v'ck'p'kpi 'x'q'n'w'o g'cpf "j go cv'q'm'i k'ec'n'uc'w'u' k'p'hgo crg'v'q'r/r'g'x'g'n'c'v'j r'v'gu'qh'f'k'h'gt'gp'v'ur qt v'0*The Journal of sports medicine and physical fitness.*"6: *5+.'r r 05; : 66250"

Qw'w'ey. 'L0gv'cr0'42350Ghgeu'qh'l'pi gu'k'qp'qh'c'eqo o gtekcm' { 'cx'ck'rd'ng'v'j gto qi g'p'le" f lgvct { 'u'w'r r'go gp'v'qp't'gu'k'pi "gp'gti { "g'z'r g'p'f'k'w't'g.'o q'q'f "uc'v'g'cpf "ect'f'k'x'c'ue'w'ct" o g'cu'w't'gu0*Journal of the International Society of Sports Nutrition.*"32*3+.'r r 0470"

Qz'hqtf 'Dt'qq'ngu'W'p'k'x'gt'uk'v' { . '42360Qz'hqtf 'Dt'qq'ngu'W'p'k'x'gt'uk'v' { /'R'ct'n'k'pi 'r gto k'v'q't'f'gt" hqto 0C'x'ck'rd'ng'c'v'<'j w'r u'1y y y 0lt'qq'ngu'0e0w'ic'd'q'w'v' dt'qq'ng'u'lu'w'v'ck'p'cd'k'v' { l't'c'x'g'n'l'w'p'k'x'gt'uk'v' { /ect/r'ct'n'k'pi l'r'ct'n'k'pi /r gto k'v'q't'f'gt/hqto l' " JCeegu'gf 'C'r't'k'i'36. '4236_0"

Rgg'n'k'pi . 'R0gv'cr0'422; 0Ghgeu'qh'G'z'gtekug"qp"J gr ek'f'lp'T'gur qp'ug'cpf "K'qp"O g'vcd'q'r'kuo " F wtkpi 'T'ge'q'x'gt { 0*International Journal of Sport Nutrition and Exercise Metabolism.*" 3; *8+.'r r 07: 567; 90"

Rg'ren'q'x'a. 'L0'Y c'rk'f. 'G0C0('Xc-'f'p'm'q'x'a. 'L0'42320Uwf { 'qh'f'c { . 'o q'p'v'j "cpf "u'g'cu'qp" r g'f'qo g'v'gt/f'g'v'gto k'p'gf "x'ct'k'd'k'v' { 'qh'r'j { u'le'c'n'c'ev'x'k'v' { 'qh'j'k'i'j "u'ej'q'q'n'r'w'r'k'u'lp'v'j'g" e'j'gej "t'gr'w'd'ike0*Journal of sports science & medicine.*."; *5+.'r r 06; 26: 0"

Rgt't'k'gt. 'G0gv'cr0'42350J { ftcv'kqp'd'k'qo ctngtu'lp'h'gg'rk'x'k'pi "cf w'u'u'y kj "f'h'gt'gp'v'rg'x'g'n'v'qh'" j cdk'w'cn'l'h'w'kf "eq'pu'wo r v'k'qp0*The British journal of nutrition.*"32; *+.'r r 089: 6: 90"

Rgugtleq. 'E00('Ocej cf q. 'HC0"42360Ego rctc± q'gpvtg'f gugo r gpj qu'f g'eqttkf c'vko g" vlcrltgcrl cf qu'go 'r kxc" g'guglct0*Revista Brasileira de Cineantropometria e Desempenho Humano*. "38*6+."r 06780"

Rj knkr u. 'U00 0'U{ngu. 'F0('I kduqp. 'P0"42360J {f tcvkqp'Ucww'cpf 'Hwlf 'Dcncpeg'qh'Gkxg" Gwtqr gcp'f qwj 'Uqeeqt'Rrc{gtu'f wtkpi 'Eqpugewkxg'Vtckpki 'Uguukpu0*Journal of sports science and medicine*. "Cr tkn:."r r 0 396: 440'

Rlej cp. 'I 0gv'cr0"3; : : 0Ghgev'qh'r tlo ct { 'j { r qj { f tcvkqp'qp'r j { ulecn'y qtnlecr cek { 0' *International Journal of Biometeorology*. "54*5+."r r 089863: 20'

Rkukrcf ku. 'f (R0'F wki pcp. 'E0('O cwi j cp. 'T00"3; : 80Ghgevu'qh'cnegtckpu'lp'f lgvct { " ectdqj { f tcvg'lpvcng'qp'tvppki 'r gthqto cpeg'f wtkpi "c"32"no 'tgcfo kn'vko g'vkcrl' *British journal of sports medicine*. "52*5+."r r 04486530"

Rrc {gt. 'F 00('Ngy ku. 'O R0"42340O gejcpluo u'cevkcckpi 'RI E/3 "cpf 'eqpugs wgpvcrl' vcpuetr vkpcrl'no gejcpluo u'hqmqy kpi "gzgtekg<C"o kpk'tgxkgy 0*Cellular and Molecular Exercise Physiology*. "3*3+."r 040"

Rqr qxc. 'U0gv'cr0"42290Ego rctkpi "creqj qrl'eqpuwo r vkqp'lp'egpvcrl'cpf "gcwgtp'Gwtqr g'vq" qvj gt'Gwtqr gcp'eqwptlgu0*Alcohol and Alcoholism*. "64*7+."r r 068766950"

Rqr qy unk "N00gv'cr0"42230Dmqf "cpf "wtkpct { "o gcwgtgu'qh'j { f tcvkqp'ucww'f wtkpi " r tqi tguukxg'cewg'f gj { f tcvkqp0*Medicine and science in sports and exercise*. "55*7+."r r 0696750'

Rtggp. 'F 0gv'cr0"42250Etgcvkpg'uw r ngo gpvcvkqp<c"eqo r ctkuqp'qh'mcf kpi "cpf " o clpvpcpeg'r tqvceqn'qp'etgcvkpg'wrcng'd { "j wo cp'unggvcr0' wueng0*International journal of sport nutrition and exercise metabolism*. "35*3+."r r 0 963330"

Rtggp. 'F 0gv'cr0"42230Ghgev'qh'etgcvkpg'mcf kpi "qp'mpi /vgt0 "ur tlv'gzgtekg'r gthqto cpeg" cpf "o gvcdqrkuo 0*Medicine and science in sports and exercise*. "55*7+."r r 0 366430"

Rtgpveg. 'C00 0gv'cr0"3; : 80J ki j "hgxgn'qh'gpgti { "gzr gpf kwtg'lp'qdgug'y qo gp0*British medical journal (Clinical research ed.)*. "4; 4*8748+."r r 0 : 5690"

Rtkej ctf /Rguej gm 'M00gv'cr0"42320Rugwf qgr j gftkpg'kpi gukqp'cpf 'e { erkpi 'vko g/vlcrl' r gthqto cpeg0*International journal of sport nutrition and exercise metabolism*. "42*4+."r r 0546: 0"

Tcdgp. 'C0'VCI NKDWG. 'C0('Cwtw. 'C0"3; : 70Vj g'tgr tqf weklkx { "qh'uwdlgevxxg" cr r gvkg'ueqtgu0*British Journal of Nutrition*. "95*26+."r r 073967520'

Tcverkh. 'N0gv'cr0"42330Vj g'lp'hvpgpeg'qh'j cdkwcn'gzgtekg'vckpki "cpf "o gcn'ht0 "qp'f lgv' kpf vefg "j gto qi gpguku'lp'eqngi g/ci g"o gp0*International journal of sport nutrition and exercise metabolism*. "43*3+."r r 036: 0'

Tcwej. 'J 0 (N0gv'cr0"42270C'uki pcnkpi 'tqr'g'ht'o wueng'i n'eqi gp'lp'y g'tgi wrcvkqp'qh' r ceg'f wtkpi 'r tqmqi gf "gzgtekg0*British journal of sports medicine*. "5; *3+."r r 0665: 0'

Tcwej. 'N0 0gv'cr0"3; : 70Vj g'ghgevu'qh'ectdqj { f tcvg'hc'f kpi "qp"o wueng'i n'eqi gp'eqpv'p'v" cpf "e { erkpi "r gthqto cpeg0*International journal of sport nutrition*. "7*3+."r r 0476580"

Tqdgw. 'L0 0gv'cr0"42340Cp'kpxguki c'kxg'uww { "lpv'j g'lp'hvpgpeg'qh'c"eqo o gtekm { "

cxckrdng'ectdqj { ftcvg/r tqvklp/grgevtqn{vg'dgxgtci g"qp"uj qtv\gtto 'tgr gcvgf "gz gtekug"
r gthqto cpeg0*Journal of the International Society of Sports Nutrition.*,"*3+.'r 00

Tqdgtdw."U0gv'cr0"42350I n'ego le'tgur qpug'vq'ectdqj { ftcvg'cpf "vj g"ghgevu'qh'gz gtekug'cpf "
r tqvklp0*Nutrition.*"4; *8+.'r 0 : 36: : 70

Tqftki wgl . 'P 00'F K'O cteq. 'P 00 0('Ncpi rg{. 'U0"422; 0Co gtlecp'Eqmgi g'qh'Ur qt w"
O gf lekpg'r quklqp"ucpf 0P wtklqp'cpf "cvj ngve'r gthqto cpeg0*Medicine and science
in sports and exercise.*"63*5+.'r 02; 6530"

Tqhg{. 'F 00 0'D{tpg. 'P 00 0('J km. 'C0R0"42280F c{/vq/f c{ 'xctlcpeg'lp'o gcuwtgo gpv'qh"
tgunlpi 'o gvdqrle'tcvg'wulpi 'xgpkrcvgf/j qqf "cpf "o qwj r kgeg"('pqug/enr 'lpf kgeu"
ecmtko gvt { 'u{ugvo u0*JPEN. Journal of parenteral and enteral nutrition.*"52*7+."
r r 06486540"

Tqmq. 'K0gv'cr0"422: 0Vj g'lpnwgepeg'qh'ectdqj { ftcvg'o qwj 'tkpug'qp'ugrh/ugngevgf "ur ggf u"
f wtkpi "c"52/o kp'tgcf o knltwp0*International journal of sport nutrition and exercise
metabolism.*"3: *8+.'r 07: 768220"

Tqmuej . 'O 0 0'Hqj t. 'L0C0('Dtgxctf. 'R0D0"42240Vj g'ghgev'qh'fkgv'o cplk wrcvklpu'qp"
cgtqdle'r gthqto cpeg0*International journal of sport nutrition and exercise
metabolism.*"34*6+.'r 06: 26; 0

Tqug. 'C0L0gv'cr0"42230Ghgev'qh'r tkqt "gz gtekug'qp"i nwequg'o gvdqrkuo 'lp'tclpgf "o gp0"
American journal of physiology. Endocrinology and metabolism."4: 3*6+.'r 0G9886
G9930

Two r rgt. 'Y 0X'gv'cr0"422: 0K gpvkh{ lpi "uqwtegu'qh'tgr qt vki "gttqt"vulpi "o gcuwtgf "hqqf "
lpveng0*European Journal of Clinical Nutrition.*"84*6+.'r 076667740"

Twj gthqtf. 'L0C0'Ur tlkv. 'N0N0('Ugnlpi y gth. 'V0"42320Vj g'ghgev'qh'cewg'cvtkpg"
lpi gunqp'qp'gpf wtcepeg'r gthqto cpeg'cpf "o gvdqrkuo 'lp'y gm'tclpgf "e{erkvu0"
International journal of sport nutrition and exercise metabolism."42*6+.'r 05446; 0"

Ucpf ut%0 . 'I 0'D%4lguqp. 'O 0('T%4lgt. 'U0"42340Kqp'F ghelkpe{ 'lp'Cf qnguegpv'Hgo crg"
Cvj ngvu0 K'Kqp'Ucwu'Chgevgf 'd{ 'Tgi wrct'Ur qt vki 'Cevxkv{ A'*Clinical Journal of
Sport Medicine.*"44*8+.'r 06; 767220"

F K'Ucpvqm. 'O 0gv'cr0"42290Cpgo lc'cpf 'tkqp'ucwu'lp"{ qwpi 'hgtvkg'pqp/r tqhguukqpen"
hgo crg'cvj ngvu0*European Journal of Applied Physiology.*"324*8+.'r 0925692; 0"

Ucy c{c. 'C0gv'cr0"3; ; 80Gxcnwclqp'qh'hqt"o gjv qf u'hqt'f gvgto kplpi "gpgti { "lpveng'lp"
{ qwpi "cpf "qrf gt'y qo gp'<eqo r ctluqp'y kj "f qwdn{ 'rdgrgf "y cvgt"o gcuwtgo gpw'qh"
vqcn'gpgti { "gzr gpf kwtg0*Am J Clin Nutr.*"85*6+.'r 06; 366; ; 0"

Ucy m. 'O 0P 0gv'cr0"42290Co gtlecp'Eqmgi g'qh'Ur qt w'0 gf lekpg'r quklqp"ucpf 0Gz gtekug"
cpf 'hmkf "tgr nrego gp0*Medicine and science in sports and exercise.*"5; *4+.'r 05996
; 20"

Ucy m. 'O 0P 0gv'cr0"3; ; 70Kpnwgepeg'qh'j gcv'utgu'cpf "ceerko cvkqp'qp"o czko cni'cgtqdle"
r qy gt0*European journal of applied physiology and occupational physiology.*"75*6+."
r r 04; 66: 0"

Ucy m. 'O 0P 0"3; ; 40Rj { ukmqi kecn'eqpugs wgpegu'qh'j { r qj { ftcvklp'<gz gtekug'r gthqto cpeg"

cpf 'y jto qtgi wvkv0Medicine and science in sports and exercise."46*8+.'r r 8796
920"

Uej o kw.'N0gv'cr0"422: 0Qr vpvk'hewu'lpf lec'lpet gcugu'j gctv'tcv'xctcdk'k' 'lp'j ki j /ngxgn'
cvj ngvu0International Journal of Sport Nutrition and Exercise Metabolism."3: *4+."
r r 88; 639: 0"

Uej qgmgt.'F 0C0"3; ; 20J qy 'Ceewtcvg'K'Ugrh/T gr qtvgf 'F kgvt { 'Gpgti { 'KpvcngA'Nutrition
Reviews."6: *32+.'r r 895659; 0"

Uej wj .'N0Q0gv'cr0"3; ; 40Gpgti { 'gzr gpf kwg'qh'gk'g'hgo crg'twppgtu'o gcuwtgf 'd { "
tgr ktcvt { 'ej co dgt'cpf 'f qwdn' 'rdgrgf 'y cvgt0Journal of applied physiology."94*3+."
r r 0456: 0"

Uej wo o .'U0F0gv'cr0"422: 0J qto qpct'gur qpug'v'ectdqj { ftcv'uwr r go gpvkv'cv'tgu'
cpf 'chgt'tgukv'peg'gzgtekug0International Journal of Sport Nutrition and Exercise
Metabolism."3: . 'r r 048264: 20'

Uekpeg'cpf 'vgej pqm { 'Eqo o gwgg."42330Alcohol guidelines."Nqpf qp0

Uj gto cp.'Y 000gv'cr0"3; ; ; 0Ghgewu'qh'6'j 'r tggz gtekug'ectdqj { ftcv'hggf kpi u'qp'e { erkp "
r gthqto cpeg0Medicine and science in sports and exercise."43*7+.'r r 07; ; 68260"

Uj ktghu.'U000gv'cr0"42260Vj g'ghgewu'qh'hk'f'tgukt'kv'qp'j { ftcv'kv'u'cwu'cpf "
uwlge'v'g'hgkpi u'lp'o cp0The British journal of nutrition."; 3*8+.'r r 0736: 0"

Uj ktghu.'U000('O cwi j cp.'T0L0"3; ; ; 0Wkpg'quo qm'kv { 'cpf 'eqpf v'v'kv { 'cu'lpf k'gu'qh'
j { ftcv'kv'u'cwu'lp'cvj ngvu'lp'y g'j gc0Medicine and science in sports and exercise."
52*33+.'r r 087; ; 68240"

Ukji rgt.'L0E0gv'cr0"42350Vj g'ghgewu'qh'ectdqj { ftcv'cpf 'o ct'kp'g'r gr v'f g'j { ftcv'kv'u'cwu'eq/
kpi g'v'kv'qp'gpf vtcpeg'gzgtekug'o g'vcdqrkuo 'cpf 'r gthqto cpeg0Journal of the
International Society of Sports Nutrition."32*3+.'r r 04; 0"

Ukntw'Nco kpc.'E0K0C0K0V0G0W0C0"42350Ghgewu'qh'h'gg'tcf k'cni'cpf 'cp'v'qz'kf cpw'qp"
gzgtekug'r gthqto cpeg0Oxidants and Antioxidants in Medical Science."4*4+.'r r 056
; 30"

Ukgt.'U0S0gv'cr0"3; ; ; 0Vj g'lpj kdk'kv'qh'i n'eqpgqi gpguku'hqmqy kpi 'creqj qn'lp'j wo cpu0
The American journal of physiology."497*3+.'r r 08; ; 96; 290"

Ukpf j k.'X0gv'cr0"42350Rqvgpv'cn'r r n'cv'kv'qp'qh'cp'v'qz'kf cpw'o'C'tgxky 0Journal of
Pharmacy Research."9*; +.'r r 04: 6: 570"

U134kp.'C000gv'cr0"3; ; ; 60Gpgti { 'dcmpeg'lp'etquu/eqwpt { 'unkgtu'c'u'w'f { 'wukpi 'f qwdn' "
rdgrgf 'y cvgt0Medicine and science in sports and exercise."48*8+.'r r 042660"

Uo cm.'N0gv'cr0"422; 0Xcnf kv { 'cpf 'Tgkcdk'kv { 'qh'Rj qvqi tcr j k'F kgv'F kct'gu'hqt 'Cuuguulpi "
F kgvt { 'Kpvcng'Co qpi 'I qwpi 'Ej kf tgp0ICAN: Infant, Child, & Adolescent
Nutrition."3*3+.'r r 0496580'

Xcp'Uqgtgp.'O 00('I tcj co .'V0G0"3; ; ; 0Ghgewu'qh'ech'gk'p'qp'o g'vcdqrkuo . 'gzgtekug'
gpf vtcpeg. 'cpf 'evgej qm'co kpg'tgr qpugu'chgt'y kj ftcv'cr0Journal of applied
physiology."; 7*6+.'r r 086; 567230"

Uqmcpgm'MLO'gv'cr0"42330Rqvgpvcn0 rcev'qh'c'722/o N'y cvgt'dqnu'cpf'dqf{''o cuu'qp"
rncuo c'quo qnrkv{'fkwkqp0*European journal of applied physiology*."333*; +"
rr0;; ; 642260"

xcp"Uqo gtgp.'MO'gv'cr0"42270Ego rctkqp'qh'vj g'Ncevcg'Rtq'cpf'Cpcmqz'I O 9"Dmqf "
Ncevcg'Cpcn(ugtu0*International Journal of Sports Medicine*."48*; +.'rr087968830"

Ur gpeg.'CNO'gv'cr0"42350C'eqo rctkqp'qh'echhkgp'xgtuwu'r ugwf qgr j gf tkgp'qp'e{enpi "
ko g/vtknr gthqto cpeg0*International journal of sport nutrition and exercise
metabolism*."45*7+.'rr07296340"

Ucej gphgrf.'P UO'gv'cr0"3; ; 80Vj kuv'cpf'hwk'f'tgi wrcvt{'t'gur qpugu'vq'j' {r gtvpkpkv{'kp"
qrf gt'cf wnu0*The American journal of physiology*."493*4+.'rr079796870"

Ucej gphgrf.'P UO'Ukrc.'EO('Mgghg.'F NO"42220Gutqi gp'o qf hkgu'vj g'vgo r gtcwtg"
ghgcu'qh'r tqi guvgtqpg0*Journal of applied physiology*." : *7+.'rr08656; 0"

Uco hqtf.'DOO'Tqy rcpf.'TO('O qhrcw.'TLO"3; 9: 0Ghgcu'qh'ugxgtg'r tkt'gz gtekug'qp"
cuuguu gpv'qh'o czko cn'qz {i gp'wrcng0*J Appl Physiol*."66*6+.'rr07; 67850"

Uqemg{'.'NO"3; : 70Ej cpi gu'lp'j'cdkwnh'qkf'kpcng'f wtkpi 'y gli j gf'kpxgpvt{'uwxg{u"
cpf'fwr rccvqp'fkgv'eqmgev'kpuOC'uj qtvt'gxkgv 0*Ecology of Food and Nutrition*."
39*5+.'rr0485648; 0"

Uwdct.'COHO"42250Wukpi 'kpcng'Dkqo ctngtu'v'Gxcnvcg'vj g'Gzvgpv'qh'F kgvt{' "
O kutgr qtvpi 'kp'c'Ncti g'Uco rrg'qh'Cf wnu<Vj g'QRGP 'Uwf {0*American Journal of
Epidemiology*."37: *3+.'rr06350"

Vctpqr qnmf.'O CO"422: 0Ghgcu'qh'echhkgp'qp'vj g'pgwtqo wuewct'u{ungo "ô 'r qvgpvcn'cu"
cp'gti qi gpk'ckf 0*Applied Physiology, Nutrition, and Metabolism*."55*8+.'rr04: 66
34; ; 0"

Vctpqr qnmf.'O CO'gv'cr0"3; ; 80Ghgcu'qh'tcr kf'y gli j v'quu'cpf'y tguvpi 'qp'o wueng"
i n{eqi gp'eqpegpvtcvqp0*Clinical journal of sport medicine*."8*4+.'rr0: 60"

Vctpqr qnmf.'O CO'gv'cr0"42230I gpf gt'f'khtgpegu'lp'ectdqj {f tcv'hqcf kpi 'ctg'tgrv'v'vq"
pggti {'kpcng0*Journal of applied physiology*."; 3*3+.'rr0476520"

Vj g'P wtkkqp'Uqelgv{'422; 0*Introduction To Human Nutrition*,"4pf "gf kkp0"

Vj qo ruqp.'HGO('D{gtu.'VO"3; ; 60F kgvt{'cuuguu gpvt'guqwtg'o cpwcr0*The Journal of
nutrition*."346*33"Uwr r n:.'r 04467U64539UO"

Xcp'Vj w{pg.'Y O'Tqgnu.'MO('F grdgng.'HOV0"42270F kwtkdwkqp'qh'Echhkgp'Ngxgnu'lp"
Wtkpg'lp'F khtgvp'Ur qtwa'lp'Tgrvqp'v'F qv kpi 'Eqvtrqr0*International Journal of
Sports Medicine*."48*; +.'rr0936693: 0"

Vqo q{cuw.'P LO'Vqjy.'O LO('Rqgj m cp.'GOV0"3; ; ; 0O kutgr qtvpi 'qh'vqcn'pggti {'kpcng"
kp'qrf gt'o gp'cpf'y qo gp0*Journal of the American Geriatrics Society*."69*8+.'rr0326
70"

Vqq| g.'LOO'gv'cr0"42260Ru{ej quqeknr'tgf levqtu'qh'pggti {'wvf gttgr qtvpi 'kp'c'rcti g"
f qwdn{'rdgrgf'y cvgt'uwf {0*Am J Clin Nutr*."9; *7+.'rr09; 76: 260"

- Vqttgu/O eI gj gg."V00'0gv'cr0"42340Ur qtw'pwtkkqp'npqy ngf i g'co qpi 'eqmgi kv'cyj ngv'gu." eqcej gu.'cyj ngv'le'tclpgtu."cpf 'utgpi yj "cpf 'eqpf kkkpki 'ur gekrkuu0*Journal of athletic training*."69*4+.'r r 04276330"
- Vtcdwnk'LO('Uej qgmgt.'F 0C0"42230Gxcnckqp'qh'f kvgt { "cuuguuo gpv'kpuvwo gpw'ci ckpuv' f qwdn' 'rdgrgf 'y cvgt.'c"dkqo ctngt'qh'j cdkwcn'gpgti { 'kpveng0*American journal of physiology. Endocrinology and metabolism*."4: 3*7+.'r r 0G: ; 36; 0"
- Vtcr r g."V0C0'gv'cr0"3; ; 90Gpgti { "gzs r p f kwt g'qh'uy ko o gtu'f wtkpi "j ki j 'xqnwo g'tclpki 0' *Medicine and science in sports and exercise*."4; *9+.'r r 0 72660"
- Xgpnwco cp.'LO0'Hgpi .'Z0('Rgpf gti cuv.'F 0"42230Ghgevu'qh'f kvgt { 'hcv'cpf "gpf wtcpeg" gz gtekug'qp'r ncuo c'eqt'kuqn'r tquci rpf kp'G4.'kpvthgtqp/i co o c'cpf 'hkr kf 'r gtqz kf gu' kp'twppgtu0*Journal of the American College of Nutrition*."42*7+.'r r 074; 6580"
- Xqrr g."U0N0'gv'cr0"422; 0Guko cvkqp'qh'Rtgr tceveg"J { f tcvkqp'Ucwu'qh'P cvkqpcn'Eqmgi kv'g" C yj ngv'le'Cuuqekcvkqp'F kkkkqp'KC yj ngvu0*Journal of athletic training*."66*8+.'r r 08460 84; 0"
- Y cmgt.'L0N0'gv'cr0"42220F kvgt { "ectdqj { f tcv'g."o wueng'i n'eqi gp'eqpvgpv."cpf "gpf wtcpeg" r gthqto cpeg'kp'y gm'vclp'gf 'y qo gp0*Journal of applied physiology*." : *8+.'r r 043736 : 0"
- Y cnij .'O 0E0'gv'cr0"42280Ghgev'qh'cewv'f kvgt { "ucpf ctf k' cvkqp'qp'yj g'wtkpct { . 'r ncuo c." cpf "ucrxct { "o gxcdqmqo le'r tqh'kgu'qh'j gcnj { "j wo cpu0*The American journal of clinical nutrition*." : 6*5+.'r r 07536; 0"
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Appendix A

Gj k'cr r tqxcn'qh'j g'uwf { 'r t gupvgf 'k' Ej cr vgt '50'

1 July 2013

Dear Dr Simpson

UREC Registration No: 130740

The variability of energy and nutrient intakes using three different dietary standardisation techniques in athletes

Thank you for the email of 20 June 2013 outlining the response to the points raised in my previous letter about the PhD study of your research student Alaaddine El-Chab, and attaching the revised documents. I am pleased to inform you that, on this basis, I have given Chair's Approval for the study to begin.

The UREC approval period for this study is two years from the date of this letter, so 1 July 2015. If you need the approval to be extended please do contact me nearer the time of expiry.

In order to monitor studies approved by the University Research Ethics Committee, we will ask you to provide a (very brief) report on the conduct and conclusions of the study in a year's time. If the study is completed in less than a year, could you please contact me and I will send you the appropriate guidelines for the report.

Yours sincerely

Hazel Abbott
Chair of the University Research Ethics Committee

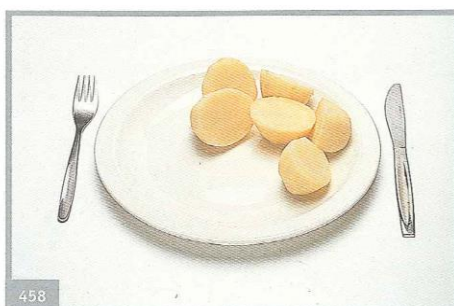
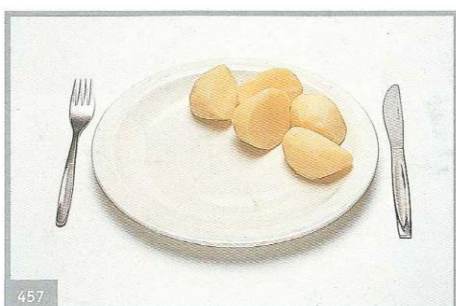
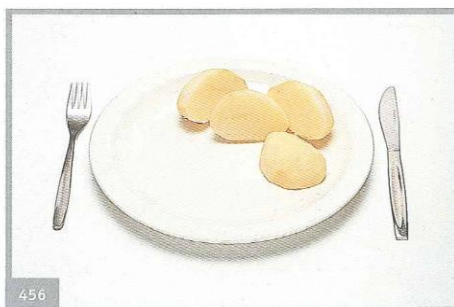
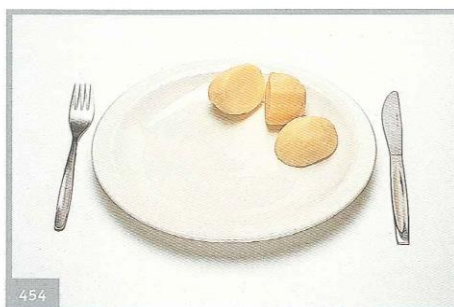
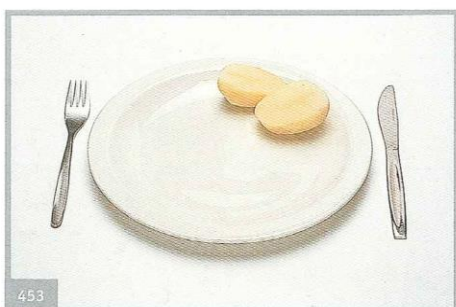
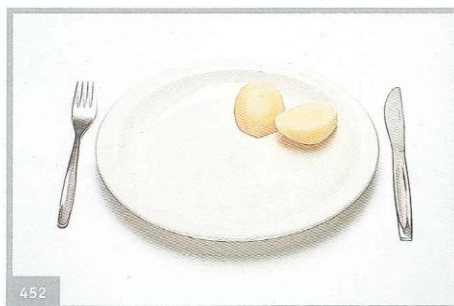
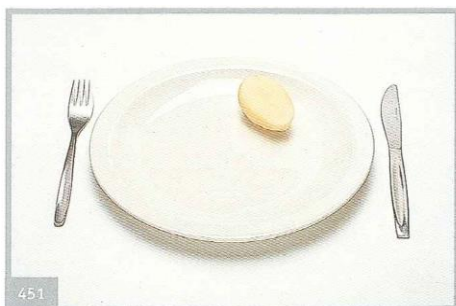
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Day Thurs		Date 31 March		
Time	Where? With whom? TV on? Table?	Food/Drink description & preparation	Brand Name	Portion size or quantity eaten
6am to 9am				
6.30 am	Kitchen Alone No TV Not at table (standing)	Filter coffee, decaffeinated milk (fresh, semi-skimmed) Sugar white	Douwe Egberts Silterspoon	Mug A little 1 level tsp
7.30 am	Kitchen Partner TV on At table	Filter coffee with milk and sugar Cornflakes Milk (fresh, semi-skimmed) Toast, granary medium sliced Light spread Marmalade	As above Tesco's own Hovis Flora Hartleys	As above 1B drowned 1 slice med spread 1 heaped tsp
9am to 12 noon				
10.15 am	Office desk Alone	Instant coffee, not decaffeinated Milk (fresh, whole) Sugar brown	Kenco	Mug A little 1 level tsp
11 am	Office desk Alone	Digestive biscuit – chocolate coated on one site	McVities	2

Time	Where? With whom? TV on? Table?	Food/Drink description & preparation	Brand Name	Portion size or quantity eaten
12 noon to 2pm				
12.30 pm	Work tea room With colleagues	Ham salad sandwich from home Bread, wholemeal, thick sliced Light spread Low fat Mayonnaise Smoked ham thinly sliced Lettuce, iceberg Cucumber with skin Unsweetened orange juice from canteen Apple with skin from home, Braeburn	Tesco's own Flora Hellmans Tesco's own Tropicana	2 slices thin spread on 1 slice 2 teaspoons 2 slices 1 leaf 4 thin slices 250ml carton medium size, core left
2pm to 5pm				
3 pm	Meeting room With supervisor	Tea, decaffeinated Milk (fresh, whole) Jaffa cake – mini variety	Twinings Tesco's own McVities	Mug Some 6

Time	Where? With whom? TV on? Table?	Food/Drink description & preparation	Brand Name	Portion size or quantity eaten
5pm to 8pm				
6.30 pm	Pub, partner	Gin Tonic water diet Lager Salted peanuts	Gordon's Schweppes Draught KP	Single measure 1/2 small glass 1 pint 1 handful
8 pm	Dining room Family TV off At table	Spaghetti, wholemeal Bolognese sauce (see recipe) Courgettes (fried in butter) Tinned peaches in juice (juice drained) Single cream UHT Orange squash No Added Sugar	Tesco's own Prince's Sainsbury's own	3b 6 tablespoons 4 tablespoons 3 halves 1 tablespoon 200ml glass, 1 part squash, 3 parts tap water
8pm to 10pm				
9 pm	Sitting room Alone TV on Not at table	Grapes, green, seedless Chocolates, chocolate creams Potato crisps, Prawn Cocktail	Bendicks Walkers	15 2 25g bag from multipack
10pm to 6am				
10.30 pm	Bed room Partner No TV Not at table	Camomile tea (no milk or sugar)	Twinings	1 mug

C'uco r ng'qh'yj g'hqf 'cvru'wugf 'lp'yj g'uwf { 'r t gupvgf 'lp'Ej cr vgt'50'



Appendix B

Gj k'cr r tqxcl'qh'j g'uwf { 'r tgu'p'gf 'lp'Ej cr vgt'60'

5 March 2015

Dear Dr Lightowler

UREC Registration No: 150904

The variability of energy and nutrient intakes using two different dietary standardisation techniques in athletes

Thank you for the email of 3 March 2015 outlining your response to the points raised in my previous letter about the PhD study of your research student Alaaddine El-Chab and attaching the revised documents. I am pleased to inform you that, on this basis, I have given Chair's Approval for the study to begin.

The UREC approval period for this study is two years from the date of this letter, so 5 March 2017. If you need the approval to be extended please do contact me nearer the time of expiry.

Should the recruitment, methodology or data storage change from your original plans, or should any study participants experience adverse physical, psychological, social, legal or economic effects from the research, please inform me with full details as soon as possible.

Yours sincerely

Hazel Abbott
Chair of the University Research Ethics Committee

Appendix C

Gj leu'cr r tqxcl'qh'vj g'uwwf { 'r t g u g p v g f 'l p 'Ej cr vgt '70'

7 August 2013

Dear Dr Simpson

UREC Registration No: 130759

The effect of two different diets on performance, nutrient oxidation and blood biomarkers

Thank you for the email of 6 August 2013 outlining the response to the points raised in my previous letter about the PhD study of your research student Alaaddine El-Chab, and attaching the revised documents. I am pleased to inform you that, on this basis, I have given Chair's Approval for the study to begin.

The UREC approval period for this study is two years from the date of this letter, so 7 August 2015. If you need the approval to be extended please do contact me nearer the time of expiry.

In order to monitor studies approved by the University Research Ethics Committee, we will ask you to provide a (very brief) report on the conduct and conclusions of the study in a year's time. If the study is completed in less than a year, could you please contact me and I will send you the appropriate guidelines for the report.

Yours sincerely

Hazel Abbott

Chair of the University Research Ethics Committee

Appendix D

Gj leu'cr r tqxcl'qh'vj g'uwwf { 'r tguqpvf 'lp'Ej cr vgt'80'

10 April 2015

Dear Dr Lightowler

UREC Registration No: 150903

The hydration status of untrained subjects participating in an experimental trial

Thank you for the email of 11 March 2015 outlining the response to the points raised in my previous letter, and for the follow up email on 30 March requesting the addition of an extra urine sample on the second visit, this refers to the PhD study of your research student Alaaddine El-Chab. I am pleased to inform you that, on this basis, I have given Chair's Approval for the study to begin.

The UREC approval period for this study is two years from the date of this letter, so 10 April 2017. If you need the approval to be extended please do contact me nearer the time of expiry.

Should the recruitment, methodology or data storage change from your original plans, or should any study participants experience adverse physical, psychological, social, legal or economic effects from the research, please inform me with full details as soon as possible.

Yours sincerely

Hazel Abbott
Chair of the University Research Ethics Committee

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Please keep a copy of this form for your future reference. Once again, thank you for your participation in this study.

Appendix E

Ethics approval of the study presented in Chapter 7.

29 May 2014

Dear Dr Clegg

UREC Registration No: 140827

The effect of acute exercise prior to glycaemic index testing on blood glucose and insulin levels

Thank you for the email of 28 May 2014 outlining the response to the points raised in my previous letter about the PhD study of your research student Alaaddine El-Chab and attaching the revised documents. I am pleased to inform you that, on this basis, I have given Chair's Approval for the study to begin.

The UREC approval period for this study is two years from the date of this letter, so 29 May 2016. If you need the approval to be extended please do contact me nearer the time of expiry.

In order to monitor studies approved by the University Research Ethics Committee, we will ask you to provide a (very brief) report on the conduct and conclusions of the study in a year's time. If the study is completed in less than a year, could you please contact me and I will send you the appropriate guidelines for the report.

Yours sincerely

Hazel Abbott
Chair of the University Research Ethics Committee